OKLAHOMA FARM-TO-SCHOOL ECONOMIC VIABILITY AND EFFICIENCY

By

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OKLAHOMA FARM-TO-SCHOOL ECONOMIC

VIABILITY AND EFFICIENCY

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"If we knew what it was we were doing, it would not be called research, would it?"

-Albert Einstein

The above statement was taped on the door of a former professor, Dr. Brian Adam, during my first semesters at Oklahoma State University. When working long hours in my office, I began to fully understand what Einstein meant and these words provided motivation to continue with my thesis despite not knowing where it would lead me.

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ABSTRACT

Farm-to-School (FTS), a school food program encouraging marketing and consumption of locally grown fruits and vegetables, began a decade ago and has since gained national recognition. The nascent food program has several difficulties with its implementation. Two particular issues addressed in this thesis are program adoption and distribution of FTS commodities. This research serves as a tool to assist food service personnel and policy makers in finding school systems likely to adopt the program and determining an efficient distribution method.

Addressing the first issue, data from a survey sent to Oklahoma school districts are analyzed using a logistic model, predicting probability of program participation according to school district characteristics. Example characteristics considered in the logit model are district size, food budgets, food distributors, campus policy, and percentage of free and reduced meals available. As district size and food budget allocated to fresh fruits and vegetables increases, so does probability of program participation. Distributors used for produce is also linked to program adoption.

Addressing the second issue, a transportation cost template was created to calculate operation cost per mile, operation cost per trip, distribution cost per unit, and the farm gate margin[1]. This template along with the results of the logit model provides information for food service personnel, farmers, and policy makers interested in FTS

[1] Farm gate margin represents the net profit for the producer at the farm.

programs. This research can also serve as a tool to evaluate past, current, and future FTS programs nationwide.

Key words: Farm-to-School, locally grown food, logistic model, program participation, distribution systems, and transportation cost

CHAPTER I

INTRODUCTION

Urban sprawl is an issue of rising concern to agriculture. The United States Department of Agriculture (USDA) reports that between 1992 and 2001, an average of 2.2 million acres of farmland is converted to urban uses (USDA-ERS, 2006). In addition, the prevalence rate of obesity for children has increased in the past 30 years (Centers for Disease Control and Prevention, 2006). These two seemingly unrelated problems lie at the heart of the Farm-To-School (FTS) program. FTS was established to connect schools with local farms allowing school food service directors to purchase produce from local farmers. The program aims to reduce childhood obesity and diabetes by increasing the number of fresh fruits and vegetables in school meals; thus improving child nutrition while decreasing calorie intake. At the same time, FTS helps farmers by promoting the consumption of local produce and expanding market opportunities available to them. This thesis aims to find ways for FTS to be more efficient in terms of program adoption and distribution methods.

Local food can be defined in many ways. According to Zepeda and Li (2006), there is no standard definition for what constitutes food as local. In terms of distance, food can be considered local if it is grown or produced within a 10-mile radius or a 100-mile radius. In terms of political boundaries, consumers generally define the term as food

grown within a county, neighboring counties, or within a state (Wilkins et al., 1996; Harris et al., 2000). For the purposes of this research, the term local food refers to food produced within a state, more specifically, Oklahoma.

Oklahomans have a greater number of severe health issues than the national average. In fact, Oklahoma is ranked second nationally in deaths due to cardiovascular disease. Since 1990, the prevalence of obesity increased by 148% (United Health Foundation, 2008). In addition to health concerns, FTS programs were implemented in Oklahoma to assist farmers with finding alternative markets. In 2002, 56% of Oklahoma farms lost an average of $9,878 (Kerr Center, 2006.) In addition, the average farm size in Oklahoma has decreased from 480 acres to 404 acres from 1992 to 2002 (Kerr Center, 2006).

FTS in the United States

FTS programs began more than a decade ago and have since gained national recognition. In 1996-1997, FTS was initiated as a pilot project in California (Santa Monica Malibu Unified School District and the Edible Schoolyard, Berkley) and in Florida (New North Florida Marketing Cooperative) (National FTS Network, 2009). In Santa Monica, the pilot project included a farmers' market salad bar, which was launched at an elementary school. Similar salad bars began appearing in schools throughout the district. In Gadsden County, Florida, the New North Florida Cooperative began selling locally grown produce to schools. The awareness of these and other nascent programs began to build momentum during this time.

In 2000, USDA's Initiative for Future Agricultural Food Systems supported the establishment of the National FTS Program, serving as a catalyst for program development, research, and policy (USDA-CSREES, 2008). The following year, the USDA Agricultural Marketing Service organized numerous FTS workshops nationwide. In 2003, the Farm-to-Cafeteria Projects Act was proposed in a bill submitted to the House and Senate, but did not receive a sufficient number of votes in congress and was not enacted. The purpose of this act was to improve access to local foods in schools and institutions (Library of Congress, 2003). The FTS program, however, was successfully enacted as a provision of the Farm Bill. The 2002 and 2008 Farm Bills included a section promoting the purchase of locally produced foods (USDA-ERS, 2008). Institutions receiving funding under the Child Nutrition Act of 1966 are encouraged to purchase unprocessed agricultural products, both locally grown and locally raised, to the maximum extent practicable and appropriate (USDA-ERS, 2008). In 2009, according to the National FTS Network (2009), as shown in Figure I-1, FTS exists in 41 states with an estimated 2,051 programs involving approximately 8,943 schools and 2,065 school districts.

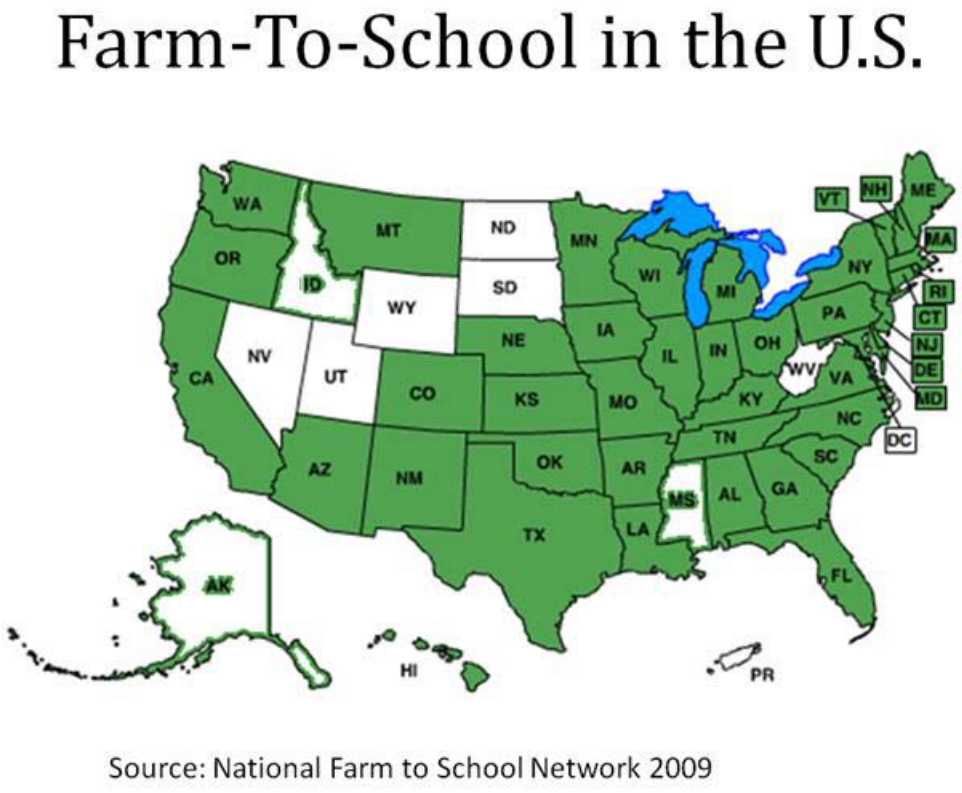

Figure I-1. Map of FTS programs in the United States

FTS in Oklahoma

Oklahoma's FTS program was started in a similar fashion to the programs in California and Florida and was lead by a pilot project. Prior to the pilot project, The Oklahoma Farm-to-School Report was published by the Oklahoma Food Policy Council in conjunction with the Kerr Center for Sustainable Agriculture, the Oklahoma Department of Agriculture, Food, and Forestry (ODAFF), and the USDA Risk Management Agency. The report contains reasons for Oklahoma FTS programs and results from a survey disseminated to food service directors of public institutions. The three main reasons for FTS programs highlighted in the report are to revitalize the

Oklahoma farm economy, increase food security, and address the health of Oklahomans, more particularly, children.

The first priority of the FTS program addresses the revitalization of the Oklahoma farm economy due to several existing concerns. The number of small and medium sized farms is decreasing due to high input costs, low product prices, and poor market access. There is concern that rural farmers are no longer able to depend upon agriculture for their livelihood. Poverty rates in non-metro Oklahoma (17.5%) are significantly higher than in metropolitan areas (12.9%) (Oklahoma Food Policy Council, 2003). FTS programs have the potential to increase market opportunities for small and medium sized farms.

The Oklahoma Commissioner of Agriculture emphasized the importance of food security in communities, which is the second point that FTS was set up to address (Oklahoma Food Policy Council, 2003). The terrorist attacks on September 11, 2001 caused concern for national security including security of food supply. In the U.S., a fresh food item is transported an average of 1,500 to 2,500 miles (Oklahoma Food Policy Council, 2003). There is concern that due to this long distance, disruption to food supplies is more likely. Through FTS programs, communities are less dependent on foreign countries for food; therefore, concerns of food shortages during times of global political unrest are reduced.

The third reason for FTS involves the overall health of Oklahomans. Oklahoma has higher rates of death due to chronic diseases when compared to the rest of the nation. Less than 50% of Oklahomans meet the recommended daily allowance for key nutrients, vegetable, grain, fruit, meat, and dairy servings (Oklahoma Food Policy Council, 2003).

Due to these facts, FTS seems to be a viable solution to addressing health issues. In Oklahoma, 61% of students participate in school a lunch program, which makes schools an ideal environment to impact children's health. It is also believed that good dietary habits learned at an early age will continually be practiced in adulthood.

The results of the survey reported in The Oklahoma Farm-to-School Report are encouraging. According to the Oklahoma Food Policy Council (2003), if price and quality were competitive and local sources were available, 68% of the institutions would like to purchase locally produced foods. The food council also reveals that large school systems (school districts with over 1,500 students) were least likely to make local purchases (83%), whereas medium (districts with 300 to 1,500 students) and small school systems (districts with less than 300 students) were slightly more likely to do so, with 72% and 74%, respectively.

As a result of positive feedback from the report, FTS began as a pilot program in 2004 with assistance from the Oklahoma Food Policy Council. This pilot program consisted of distributing seedless watermelons grown near Hinton, Oklahoma to 144 schools in 6 districts. In 2006, the Oklahoma State Legislature passed the Oklahoma Farm to School Program Act in order to provide schools with minimally processed farm commodities grown in Oklahoma (Oklahoma Legislature, 2006). The act also encourages activities integrating nutrition and agriculture in school curriculum. To date, there are 59 Oklahoma school districts that have participated in a FTS program (see estimated map in Figure I-2).

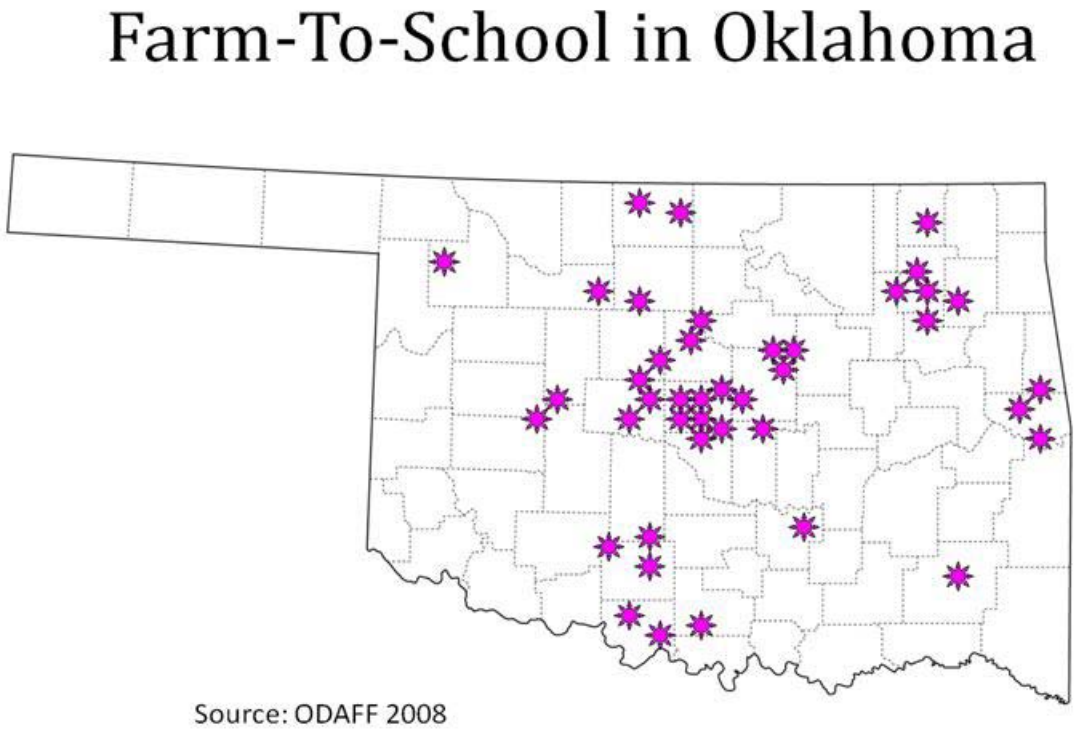

Figure I-2. Map of FTS programs in Oklahoma

Why FTS?

There are various reasons why consumers and producers participate in FTS. For FTS, consumers consist of food service directors, communities, parents, and children; whereas, producers are the farmers. Some of the motivations behind FTS participation are shared among producers and consumers. However, the basic premise behind FTS participation for each entity is inherently different.

FTS research shows that food service directors participate in FTS programs to: support the local economy (Izumi et al., 2006; Oklahoma Food Policy Council, 2003; Vogt and Kaiser, 2006), have access to a fresher product (Izumi et al., 2006; Oklahoma Food Policy Council, 2003; Vogt and Kaiser, 2006), and increase fruit and vegetable consumption among children (Izumi, Wright, and Hamm, 2009; Joshi and Azuma, 2009).

Communities are willing to participate in FTS programs because they provide fresh food from known sources to consumers (Bellows, Dufour, and Bachmann, 2003; Sanger and Zenz, 2004). There are also beliefs that local farms have produce with superior taste and quality (Bellows, Dufour, and Bachmann, 2003). The National FTS Network sprouted from the desire to support community-based food systems, strengthen family farms, and improve student health by reducing childhood obesity (Center for Food and Justice, 2009.) FTS, unlike other school-based programs, involves parents, gardeners, farmers, and community members. FTS gives food service directors and community members the opportunity to become actively involved in schoolchildren's health and have a positive outlook towards school food programs.

For the producers, FTS is a program that gives them an additional market outlet where geographic proximity limits competition. Currently, much of the research and interviews with farmers who participate in FTS show that FTS accounts for only a small fraction of business for the farmers; however, many farmers express the desire to participate and feel FTS could become a more profitable program in the future. Farmers typically report FTS programs contribute approximately 5-10% of their income (Joshi and Azuma, 2009). According to a study in Vermont, all farmers involved in the Burlington School Food Project enjoy having the opportunity to educated students about their farms and the potential FTS provided for direct marketing opportunities (Schmidt and Kolodinsky, 2006). A study of 6 California farmers reported profits and quantities related to FTS were too small to contribute to an overall profit margin; nevertheless, farmers want to nurture the program for its potential benefits (Joshi and Azuma, 2009). These sentiments are shared by the single largest producer participating in the Oklahoma

FTS program (Hughes, Kirby, Holcomb, 2009). Like food service directors and communities, the farmers consider FTS as a program that is in line with their own values and FTS is a program that creates synergy among farmers, school personnel, children, and other community members (Ohmart, 2002).

FTS is a program that allows local farmers to market their goods directly or "almost directly" to schools. Under usual circumstances, small-sized, local farms would not be able to sell their products to schools in this manner. Small-sized, local farms do not have the opportunity to take advantage of economies of scale and cannot compete with industrialized farms. Small-scale farms have typically been perceived as inefficient since they lack the ability to cut costs with economies of scale (Buitenhuys et al., 1983). In addition, school cafeterias traditionally operate with minimal budgets. Historically, food service professional in schools are known to operate under extremely tight time and budget constraints (Izumi, Wright, and Hamm, 2009). Participation in FTS programs can incur additional cafeteria costs and requires more time from food service professionals to coordinate food orders.

Institutions such as schools with minimal budgets can now participate in FTS due to a couple of reasons. One reason is that political influence from advocates for localism has penetrated the school food system. Orden and Paarlberg (2001) predict that process-defined farmers and like-minded consumer activists would try to persuade government to regulate agricultural products according to production processes, such as locally grown foods. This form of persuasion in government to enact policy to gain economic benefit is a form of rent-seeking. A more formal definition of rent-seeking is to influence governments to acquire or resist wealth transfers (Tullock, 1967). Examples of rent-

seeking are monopolies, tariffs, and other forms of government regulation. Rent-seeking incurs social costs for two reasons—loss of consumer and producer surplus from monopolization and resources spent in the pursuit of economic rents, which result in a loss to society because the expended resources do not create additional social product (Tollison, 1982). Due to rent-seeking activities, small-scale farms are able to thrive.

A second reason why FTS is a viable program is that farmers are able to market a unique product—local foods. Farmers with local foods are able to pursue a formerly untapped market opportunity. FTS provides an additional market outlet for farmers and gives greater potential for profitability. With government and community support for programs such as FTS, small and medium sized farms, despite their inability to take advantage of economies of size, are able to compete with larger farms. It is imperative to acknowledge that FTS, like many government programs, is not solely based on supply and demand and that there are self-interests groups seeking profit. These existing inefficiencies in food systems reinforce the necessity of finding ways for programs such as FTS to become more efficient.

Problem statement

Numerous issues pertain to FTS, such as operation costs, supply, program adoption, and distribution. This study is limited to the issues of program adoption and distribution, more specifically, the probability of FTS participation and distribution costs. Over 2000 FTS programs exist in the U.S. (National FTS Network, 2009). Many FTS programs, past and present, have been implemented, but not all of the programs are successful. FTS literature exists on program costs and benefits in addition to how to

implement the programs. However, there is no literature on where to implement FTS to ensure program success. The same scenario exists for issues related to distribution. With distribution reported as one of the main barriers to FTS adoption, (Berkenkamp, 2006; Vogt and Kaiser, 2006; and Zajfen, 2008) research on the matter is vital to a successful program.

The distribution of FTS commodities can be carried out in various ways. For this research, when directors of FTS programs in various states were surveyed as to what distribution methods are most salient within their state, many of them responded that the distribution of FTS commodities was piecemeal and varied throughout their state. A paper by Kalb and Barron (2005) contains four different distribution models for FTS commodities each with a farmer, cooperative, or wholesaler delivering food, in addition to the option of school personnel picking up produce from a farmers' market. Various vehicles, distances, distribution companies, and third party entities can play a role in distribution of FTS. Organizing the myriad of options available when distributing FTS commodities will help identify a least cost distribution system applicable to Oklahoma. For this thesis, three different entities are separately considered responsible for distribution, each with a possibility of backhauling produce. The entities considered to carry out delivery are farmers, where the farmer is responsible for negotiation and delivery; warehouses, where a warehouse or large distributor takes ownership of the produce and negotiates pricing and delivery; and intermediaries, such as another producer, cooperative, broker, or small contract distributor. The three different delivery methods will be referred to as direct delivery (DD), warehouse delivery (WD), and

intermediary delivery (ID), respectively. Determining which of the three options for distribution is least costly will allow for FTS programs in Oklahoma to be cost efficient.

Due to budget constraints, economic uncertainties, and the fact that FTS is gaining more national recognition, information regarding program adoption and distribution will be useful to food and agricultural policy makers, school food service directors, and producers and consumers interested in FTS.

Objectives

The objective of this research is to address issues concerning FTS program adoption and distribution.

Specifically, the aim is:

(1) To determine what school district characteristics are associated with FTS participation; and

(2) To identify a least cost method to distribute produce to school districts.

Thesis overview

The remaining chapters of this thesis address program adoption and transportation. These chapters outline the motivation for the thesis, methodologies used, and the results and conclusions of this study. Chapter II cites the existing literature written on school meal and FTS participation and transportation costs. These cited works lay a foundation for the research and identify areas lacking sufficient examination. Chapter III describes the methods and procedures used for explaining the survey design, the statistical methods for identification of school

district characteristics associated with FTS participation, and the cost template created to determine a least cost distribution method for FTS. Chapter IV presents the findings and discussion of the results. Finally, Chapter V examines how the research has addressed the objectives, followed by a summary of results, policy implications due to these results, and suggestions for further research.

CHAPTER II

LITERATURE REVIEW

The literature review analyzes current research related to FTS. Areas of research included in this literature review cover food program participation and transportation.

Program participation

Govindasamy et al. (1998) use logistical models to evaluate the effectiveness of the Jersey Fresh Program, a state sponsored agricultural program created to increase buying of local produce. The purposes of the models are to predict consumer awareness and willingness to buy Jersey Fresh produce. Produce origin is not statistically significant in the models described in the paper. The prominent demographic characteristic of consumers who are more likely to have bought Jersey Fresh produce are those who were female, 35 years or age, and have a high school or higher education. Awareness of Jersey Fresh is high among consumers who frequented direct marketing facilities. Quality is considered the most important factor by both consumers who have bought Jersey Fresh produce and those who were willing to buy Jersey Fresh produce (Govindasamy et al., 1998).

Many researchers find relationships between participation in school lunch and breakfast programs and school characteristics. Maurer (1984) uses national data to

estimate the effects various school and program characteristics have on lunch and breakfast programs. Variables listed under school and program characteristics are breakfast program availability, open campus policy, à la carte service availability, vending machine availability, number of meal choices, and offer verses served meals. Maurer finds students from low-income families are more likely to participate in breakfast and lunch programs than those from families with high income. In addition, students tend to participate in the programs regularly (4 or 5 days a week) or not at all. Results also show students are slightly more likely to participate in lunch programs at schools with breakfast programs available.

Research from Ham, Hiemstra, and Yoon (2002) describes an ordinary least squares approach to estimate participation of school lunch programs in Indiana. Two dependent variables are examined: total average daily participation rate of all students (Total ADP) and paid average daily participation rate of paid meals (Paid ADP). Total ADP differs from Paid ADP, in that Total ADP includes free and reduced-price meals in addition to those paid. Participation is measured by the number of meals served. The authors find the percentage of students eligible for reduced lunch and free lunch were both significant and positive predictors for Total ADP. However, for Paid ADP, reduced lunch and free lunch were both statistically significant yet showed positive and negative relationships, respectively. This means as the number of students eligible for free lunch increases, the amount of Paid ADP decreases. Larger schools have higher school lunch participation rates and schools with open campus policies have lower rates (Ham, Hiemstra, and Yoon 2002).

Gleason (1995) uses a probit model to estimate participation rates in the National School Lunch Program (NSLP) and the School Breakfast Program (SBP). Three main questions are addressed: Who is participating in the NLSP and SBP? What policy changes at the school, district, or federal levels could directly influence the number or type of participants? Would policy changes designed to improve nutritional quality of school meals adversely affect program participation as a whole? Free and reduced meal certification status of students is strongly related to NSLP participation. The author finds that, "more than three-fourths of certified students eat a school lunch on a given day, compared with fewer than half who pay the full price" (Gleason, 1995, 215).

Grainger, Senauer, and Runge (2005) use logistic models to analyze student receptiveness to health innovations in a high school cafeteria in Minneapolis. When à la carte and full meals are analyzed together, students clearly make healthier food choices, described as meals with less trans fats, low in sugar, and high in fiber. Minorities, with the exception of Asians, make less healthy lunch choices (Grainger, Senauer, and Runge, 2005).

Murray (2005) reports descriptive statistics on the characteristics of colleges participating in FTS. College FTS programs are concentrated in Northeast, Midwest, and West Coast areas. Sixty-five percent of the programs are private, 35% are public, and 41% are self-operated whereas 59% are contract-managed food services. About 20% of the programs use external funding sources. The most frequently cited program barrier is coordinating purchases and delivery of commodities.

Transportation costs

The number of studies conducted on the distribution of FTS commodities is sparse. Kalb and Barron (2005) acknowledge many issues must be considered when determining a means to transport farm commodities to schools. Some of the issues are school district size, cafeteria storage capacity, existence of farmer cooperatives or networks, volume and type of commodity delivered, and delivery capacity. The authors describe four distribution methods. These FTS distribution methods include obtaining local commodities from individual farmers, cooperatives, wholesalers, farmers' markets. Kalb and Barron explain advantages and disadvantages with each method; however, this paper does not address the associated cost with these methods.

Zajfen (2008) highlights current distribution models and makes suggestions for increased distribution. The distribution models are particular to the Greater Los Angeles region and many of them are similar to those mentioned by Kalb and Barron. These distribution models include large produce firms, smaller produce firms, shipping firms, farmer direct, farmers' markets, CSAs, and firms selling ready-made school lunches. The publication, however, does not compare the costs of each distribution method.

There are researchers that analyze the specific costs associated with alternative transportation methods; two examples are Berwick and Dooley (1997) and Barnes and Langworthy (2003). Computer programs exist to calculate transportation costs, conveniently allowing modification in order to adhere to specific scenarios and conditions.

Berwick and Dooley (1997) provide a spreadsheet simulation model to estimate truck costs for different truck configurations, trailer types, and trip movements. The spreadsheet allows for owners and operators to benchmark performance against competitors and industry standards. Berwick and Dooley (1997) estimate cost per mile, cost per 100 weight, cost per ton-mile, cost per hour, and cost per trip along with sensitivity analyses. The authors of the study find factors influencing cost of owner/operator costs to include annual miles, trip distance, and truck speed or fuel efficiency. Decreasing annual miles and waiting for additional loads may prove to be more profitable than having fewer loads (Berwick and Dooley, 1997). Wait time is another important contributor to costs. The shorter the trip, the larger an impact the loading and unloading time has on costs. Fuel efficiency is also a major factor in costs. Revenue may be higher by driving 55 miles per hour instead of 70 miles per hour. Nevertheless, the increased revenue from more business may offset higher fuel costs.

Barnes and Langworthy (2003) describe a methodology and spreadsheet model for calculating the costs of operating cars and trucks with varying road conditions. The study serves as a cost-benefit analysis of highway projects and includes only variable costs. Information on trucking costs tends to focus on the full cost of taking a load from point A to point B, which includes many costs that are fixed and would be incurred whether the trip was taken or not (Barnes and Langworthy, 2003). The authors find that city driving conditions with frequent stops increases the baseline cost of highway driving on smooth pavement by 9.5 cent for trucks. Extreme rough

pavement increases the baseline cost by 5.5 cents for trucks. These studies provide a basis of information for the template used for FTS distribution.

Numerous researchers have analyzed participation in various food programs using logit models and have developed templates to calculate transportation costs, but none of these studies has applied these tools to FTS. Therefore, this thesis aims to address a fundamental lack of information and is necessary to analyze the effects of district characteristics on FTS program participation and determine least cost distribution methods for FTS commodities. Reliable cost estimates will help determine an efficient distribution alternative and be useful to schools, farmers, and all third-party entities. In addition, policy makers can use the information gathered from the logit model and the cost template when determining whether to implement a FTS program.

CHAPTER III

METHODS AND PROCEDURES

Data collection

In order to fulfill the thesis objective, a survey of Oklahoma school districts, titled the Oklahoma Child Nutrition Survey (see Appendix I), was conducted under the auspices of the Robert M. Kerr Food and Agricultural Products Center at Oklahoma State University. Districts participating in FTS and those not participating in FTS are referred to as FTS participants and non-FTS participants, respectively. The following information was obtained through the surveys: school district size, current suppliers of fruits and vegetables to the schools, the portion of the schools' food budget allocated for fruits and vegetables, distributors utilized by the schools when placing food orders, and produce preferences. With assistance from the Oklahoma Department of Agriculture, Food, and Forestry (ODAFF) FTS coordinator and the Coordinator of Child Nutrition for the Stillwater Independent School District, the Child Nutrition in Oklahoma Survey was created with a total of 24 questions.

Prior to sending the survey, pre-tests were conducted with surveys emailed to various food service directors to ensure the questions were perceived correctly and the answers corresponded with the information needed for the research. After responses from the pre-tests were collected, a web-based survey was sent to Oklahoma school districts

participating in FTS via e-mail a third party survey company. This method of conducting the surveys was the most expedient option for the respondents and the researcher in comparison to telephone, in-person, or mailed surveys.

The sample frame consists of food service directors, child nutritionists, superintendents, and other school personnel from Oklahoma school districts. Contact information was obtained from the State Department of Education (SDE) which included names of school personnel, phone numbers, emails, and addresses. Data on the districts participating in FTS was also provided by the ODAFF.

The survey was sent out in August 2008 to over 800 school personnel in Oklahoma. Although there are only 535 school districts in Oklahoma, the contact list provided by the SDE had more than one contact name listed for the majority of the districts. Many of the emails were either incorrect or outdated causing for many of the emails to be returned to the sender. In some cases, the security network of certain districts would not allow emails to be received from unknown parties, also resulting in returned emails. The emails were sent out a total of three times over a period of three months to remind the recipients of the survey. The response rates to the emailed survey were 30% for the first send, an additional 17% from the second email, and finally another 10% from the third email attempt. Some recipients requested that a survey to be sent in paper form via mail. Less than 1% of the responses were obtained from mailed surveys. Overall, there was approximately a 57% response rate to the survey. Because there were multiple responses for some districts, duplicate surveys were removed from the sample. In addition, some responses were erroneous and were also removed resulting in a final 52% response rate of useable surveys.

Although conducting the survey via email may have saved time and money, many of the responses were omitted leaving surveys incomplete. In an attempt to have more complete information on the districts, additional information was retrieved from the SDE website including the number of students enrolled in a district (Question 2 in the Child Nutrition in Oklahoma Survey) and the percentage of free and reduced meals received by the district (Question 6). Because the question regarding district size captures only ranges and not exact numbers, the information on district size was then replaced with the exact population sizes from the SDE. Since ODAFF is aware of the current and past participants of FTS in Oklahoma, that information was included for the respondents who did not state whether their district has participated in FTS (question #8).

The question regarding the percentage of free and reduced priced meals refers to the amount the district receives and not the percentage of students eligible, therefore, values used to replace missing values may not be completely accurate. Finally, the information on the total expenditure on food (question #14) was also omitted in some of the surveys and in attempt to retrieve this information, means according to district size were calculated and then replaced for missing values. After these efforts to obtain complete sets of data, a total of 276 observations were used for analysis.

A survey for distributors, titled, Oklahoma Food Distributor Survey (see Appendix II), was also conducted during this research. Thirteen food distributors were included in this survey process. The list of distributors was provided by the FTS coordinator from ODAFF. The survey includes questions on fee structures, delivery truck type, and fees incurred when doing business with Oklahoma farmers. The survey was sent to food distributors via email. The response rate of the survey was 69%.

The second portion of the research objective, determining a least cost method to distribute FTS commodities, is fulfilled by creating a cost template. Some of the information used for the cost template was obtained from an interview with an Oklahoma Farmer, Kevin Hughes. Mr. Hughes has participated in FTS since the FTS pilot program in 2004-2005, when he supplied seedless watermelons to schools during the year. Later, Mr. Hughes continued to participate in FTS through a Statewide FTS program and is continually providing seedless watermelons. The questions Mr. Hughes addresses (see Appendix III) involve information about his FTS participation, costs, and distribution methods used by the farmer. Though the values in the template take into account information on one farmer, the models and methods of calculating distribution costs can be applied to various other farms and produce types.

Program participation - Logistic model

An alternative to an OLS regression is needed when estimating a dichotomous independent variable because two standard assumptions of linear regression do not hold: homoscedasticity of error terms and error terms are normally distributed about the mean. Estimation techniques such as logistic modeling address these issues.

Logistic and probit models are often used for estimating dichotomous variables; however, the logit is easier to compute and provides odds ratios useful for interpretation of coefficients. The utility function of the school districts when choosing whether to participate in FTS is a random utility function, which is shown in eq. III-1,

(III-1) $$U_{ij} = V_{ij} + \varepsilon_{ij}$$

where *j* represents the districts and *i* is the choice option of participating (FTS) or not participating (NFTS) in the program. U_{ij} is the district's utility defined by a deterministic (V_{ij}) and a stochastic (ε_{ij}) component. Assuming V_{ij} is linear in parameters, the utility function may be expressed as eq. III-2,

(III-2) $$V_{ij} = \beta_0 + \sum_{k=1}^{6} \beta_k X_{kij}$$

X_{kij} represents characteristic k (k=1,…, 6) of the j^{th} district for the i^{th} choice option. β_k is the coefficient associated with X_{kij}. The district utility is not observable but the choice to participate or not to participate in FTS is. A district chooses to participate in the program when the utility of participating is greater than the utility of not participating; thus, the probability for a district to participate in FTS program can be described by eq. III-3, assuming the distribution of the error terms (stochastic component) is independent and identical:

(III-3) $$\text{Prob}\ (FTS) = P(U_{FTSj} > U_{NFTSj})$$

A binary logistic model could be used to fit the regression, as show in eq. III-4 and III-5. Let NFTS be the reference category where the parameter estimates are normalized to zero. Let P_j denote the probability that a j^{th} district chooses to participate in FTS. The probability for a district to participate in FTS program can be expressed in eq. III-4,

(III-4) $$P_j(FTS) = \frac{exp(\beta_k X_{kj})}{1 + exp(\beta_k X_{kj})}$$

The empirical model used for the analysis is seen in eq.III-5 and III-6,

(III-5) $$P_j(FTS) \quad = \beta_0 + \sum_{k=1}^{6} \beta_k X_{kij}$$

further,

(III-6) $$\begin{aligned} P_j(FTS) \quad &= \beta_0 \ + \beta_1 \ DISTRICT\_SIZE_j + \beta_2 \ FREE\_AND\_REDUCED_j \\ &+ \beta_3 \ \text{SUMMER\_FEED}_j + \beta_4 \ CAMPUS\_POLICY_j \\ &+ \beta_5 \ \text{DISTRIBUTOR\_PRODUCE}_j + \beta_6 \ \text{BUDGET}_j \end{aligned}$$

Equation III-6 represents the deterministic portion of the utility function, which is expressed as the sum product of the parameters of the independent variables listed.

Because interpretation of the coefficients in logistic models are not intuitive, alternative means of understanding coefficients are used. The marginal effect is estimated using eq. III-7,

(III-7) $$\frac{\partial P_j}{\partial X_{kj}} = \frac{exp\left(\beta_k X_{kj}\right)}{\left[1 + exp\left(\beta_k X_{kj}\right)\right]^2} \beta_k$$

where X_{kj} is a particular explanatory variable and β_k is the coefficient associated with X_{kj}. Applying this equation, if the base or reference equation contains X_{kj} values equal to their means, then the change in probability can be observed for a 1-unit or a 1% increase in X_{kj}. The change in probability depends upon the logit regression coefficients and the value of the probabilities. Marginal effects are used to measure changes in probability of participation in the FTS program due to given changes in the independent or explanatory variables.

In this study, 12 variables were analyzed before the final 6 were determined for the logistic model. Here, a description of the 12 variables and discussion on how the final variables were determined is presented. In the logit model, *DISTRICT_SIZE* is a continuous variable representing the size of the district according to student population.

In Oklahoma, district sizes can range from approximately 40 students to 40,000 students (State Department of Education, 2008).

School food programs can consist of the National School Lunch Program (NSLP), the School Breakfast Program (SBP), and summer feeding programs. *BREAKFAST* is treated as a continuous variable determined by the number of students participating in breakfast programs. *SUMMER_FEED* is a binary variable associated with whether a school district has a summer feeding program. *CAMPUS_POLICY* is a binary variable indicating whether the districts have an open campus policy, allowing students to leave campus during lunch hours, or a closed campus policy.

Cafeteria management practices differ from district to district. *DELIVERY_FREQUENCY*, a continuous variable, represents the number of deliveries for produce received within a month. *PRE_CUT_BAGGED* is a continuous variable indicating the percentage of produce received that is pre-cut and bagged. *DISTRIBUTOR_ALL_ITEMS*, a binary variable, represents the type of food distributor used by school districts when ordering all food items including any form of fruits and vegetables. In Oklahoma, there are approximately 15 main food distributors or wholesalers who commonly provide food items for schools. Small, less common distributors and grocery stores were categorized as one group, and the large, more common distributors were categorized in another. The same classification technique was applied to distributors of only fresh fruits and vegetables—making *DISTRIBUTOR_PRODUCE* a binary variable as well. The impact of grocery stores used for school food orders on FTS participation was also determined. In this case, grocery stores were coded separately from all other distributors, where grocery stores were coded

as 1 and all other distributors were coded as 0. *GROCERY_ALL* represents the grocery stores used for all food items including any form of fruits and vegetables. *GROCERY_PRODUCE* represents the grocery stores used for only fresh fruits and vegetables.

Cafeteria budgets are limited and play an important role in determining food program participation and purchasing. Schools are reimbursed for free and reduced meals offered to students and the assistance available is dependent upon income eligibility of the student (Spark, 2007). The variable associated with the percentage of free and reduced meals offered is a continuous variable labeled, *FREE_REDUCE*. The variable, *BUDGET*, is continuous and refers to the percentage of cafeteria food budgets allocated to produce alone.

All of the mentioned variables were tested against the chi-square statistic in relation to FTS participation. *GROCERY_PRODUCE* and *GROCERY_ALL* were not statistically significant at the 5% level and were grouped with *DISTRIBUTOR_PRODUCE* and *DISTRIBUTOR_ALL*, respectively, where they were newly considered as small, less common distributors. A test for correlation between the 10 newly defined variables and FTS participation was conducted. Five variables were statistically significant at the 5% level and two were significant at the 10% level. Next, a correlation between the 7 explanatory variables was conducted. Two of the variables, DISTRICT_*SIZE* and *BREAKFAST* were closely correlated. To avoid multicollinearity, *BREAKFAST* was eliminated, leaving 6 variables to be estimated in the logistic model. All the explanatory variables considered for this research are described in detail in Table III-1.

Table III-1. Description of categorical variables used in logit model

Independent variables	Coding
DISTRICT_SIZE (students)	District size (continuous variable ranging from 0-40,000)
BREAKFAST	Existing breakfast program (yes=1, no=0)
SUMMER_FEED	Existing summer feeding program (yes=1, no=0)
CAMPUS_POLICY	Campus policy during lunch hours (open=1, closed=0)
DELIVERY_FREQUENCY	Frequency of produce delivery (1=once a month, 2=twice a month, 4=once a week, 8=twice a week)
PRE_CUT_BAGGED (percentage)	Amount of produce received pre-cut and bagged (continuous variable ranging from 10-100)
FREE_REDUCED (percentage)	Student population receiving free and reduced meals (continuous variable ranging from 0-100)
BUDGET (percentage)	Amount of cafeteria food budget allocated to fresh produce (continuous variable ranging from 0% to 70%)
DISTRIBUTOR_ALL	Distributor used for all food items (less common, small distributor and grocery store=1, commonly used, large distributor=0)
DISTRIBUTOR_PRODUCE	Distributor used for produce (less common, small distributor and grocery store=1, commonly used, large distributor=0)
GROCERY_ALL	Distributor used for all food items (grocery store=1, all other distributors=0)
GROCERY_PRODUCE	Distributor used for produce (grocery store=1, all other distributors=0)

Maximum likelihood estimation

There are many ways to estimate a logistic model, but maximum likelihood (ML) estimation is most widely used. There are appealing properties associated with using the ML approach. First, as the sample size increases, the probability of the estimates falling within the range of some true value also increases. Second, due to asymptotic efficiency of larger samples, the standard errors computed are as efficient (small) as those for any

other estimation model. Third, the sampling distribution of the estimates is normal in large samples, meaning normal and chi-squared distributions are valid when calculating confidence intervals and p-values. ML maximizes the probability of observing an outcome given available parameters. This is accomplished by constructing a likelihood function and maximization, which entails iterative successive approximations (Allison, 1999).

Using Statistical Analysis Software to run a logistic model, the estimates automatically predict the probability of obtaining the lowest possible value of the dependent variable. In this study, the lowest value for y is 0, which is predicting the likelihood of not participating in FTS. Otherwise, participating in FTS means y is 1. In this case, the word "descending" will be added in the statistical code to predict the needed outcome—the probability of participating in FTS.

The results of a logistic model give parameter estimates and hypotheses tests. To test the overall model, the section, Testing Global Null Hypothesis: Beta=0, has three chi-square statistics: likelihood ratio chi-square, score statistic, and Wald test statistic. There is no reason to prefer either of these statistics, they will be generally quite close (Allison, 1999). For the FTS logistic model, the likelihood ratio, score statistic, and Wald score are either all either equal to or less than .0005, so we reject the null hypothesis and conclude at least one of the coefficients is not 0.

Contingency tables and chi-square tests

Two-way contingency tables also known as frequency tables, are used to classify two qualitative variables, and can illustrate associations between variables. The data used

for these tables are discrete. Data observations are recorded as frequencies with corresponding probabilities. To test if the results of a contingency table are not due to chance, a chi-square test can be applied.

When frequency tables are large (with more than four cells), it is best to combine or collapse cells. For example, a frequency table with the dependent variable, FTS participation and the independent variable, delivery frequency, there are two possible responses for FTS participation, and four for delivery frequency. The possible answers for FTS participation are yes and no. In the Child Nutrition in Oklahoma survey, there are four possible responses for a question on delivery frequency: twice a week, once a week, twice a month, and once a month. It is possible to combine the categories with weekly intervals into one group and those for the monthly intervals into another. Therefore, delivery frequency would be divided into two groups instead of four where one group has deliveries taking place at least once a week and the second group having deliveries twice a month or less. This procedure was applied to all variables with more than two possible responses, including the responses with continuous variables as answers. The newly coded variables were then treated as binary variables. For a complete list of how the variables were coded for the chi-square test, see Table III-2.

Table III-2. Description of categorical variables used for chi-square test

Independent variables	Coding
DISTRICT_SIZE (students)	District size (2,500 or more=1, less than 2,500=0)
BREAKFAST	Existing breakfast program (yes=1, no=0)
CAMPUS_POLICY	Campus policy during lunch hours (open=1, closed=0)
SUMMER_FEED	Existing summer feeding program (yes=1, no=0)
DELIVERY_FREQUENCY	Frequency of produce delivery (once a week or more=1, less than once a week=0)
PRE_CUT_BAGGED (percentage)	Amount of produce received pre-cut and bagged (greater than 25=1, 25 or less=0)
DISTRIBUTOR_PRODUCE	Distributor used for produce (less common, small distributor and grocery store=1, commonly used, large distributor=0)
DISTRIBUTOR_ALL	Distributor used for all food items (less common, small distributor and grocery store=1, commonly used, large distributor=0)
FREE_REDUCED (percentage)	Student population receiving free and reduced meals (greater than 50=1, 50 or less=0)
BUDGET (percentage)	Amount of cafeteria food budget allocated to fresh produce (greater than 20=1, 20 or less=0)
GROCERY_PRODUCE	Distributor used for produce (grocery store=1, all other distributors=0)
GROCERY_ALL	Distributor used for all food items (grocery store=1, all other distributors=0)

Building the logit model and evaluating marginal probabilities will fulfill the first portion of the objective in determining characteristics associated with FTS participation. Addressed next is the second portion of the research objective, to identify a least cost method to distribute FTS produce. To fulfill this objective, a transportation cost template and cost curves were created and will be discussed.

CHAPTER IV

DATA SUMMARY

The results of the Child Nutrition in Oklahoma Survey are summarized and discussed in a number of ways: aggregate responses, responses by district size, and responses by FTS participation level.

Table IV-1. District size and number of students served according to district size

Number	Question						
2.	**Please classify the school district population under one of the following categories[a]:**						
		District size					
		< 500	500-1,000	1,000-2,500	2,500-5,000	5,000-10,000	> 10,000
	Number	153[b]	54	45	13	3	8
	Percent	55%[b]	20%	16%	5%	1%	3%
3.	**On average, how many students does your district serve per day during the school year?[c]**						
		Range of number of students served					
		< 500	500-1,000	1,000-2,500	2,500-5,000	5,000-10,000	> 10,000
	Number	179	50	27	7	4	6
	Percent	66%	18%	10%	3%	1%	2%

[a]N=276
[b]153 respondents (55%) reported a school district of 500 students or less.
[c]N=273

District size refers to the number of students enrolled within each school district. Table IV-1 illustrates the majority of the schools responding to Question 2 are of smaller size (population of 500 students or less). Question 3 is pertinent because not all students

participate in school meal programs. Some students have the option of bringing a sack lunch or buying food outside of the school lunch and breakfast program.

Table IV-2. Breakfast and summer feeding programs and campus policy according to FTS participation

Number	Question			
4.	**Do your schools participate in breakfast programs? If so, how many students do you serve per day with the breakfast program?[a]**			
			No breakfast program	Breakfast program
	Non-FTS participant	Number	13[b]	231
		Percent	5%[b]	95%
	FTS participant	Number	0	29
		Percent	0%	100%
5.	**Do any of the schools within your district house a summer feeding program?[c]**			
			No summer feeding program	Summer feeding program
	Non-FTS participant	Number	183	62
		Percent	75%	25%
	FTS participant	Number	16	13
		Percent	55%	45%
7.	**Is your school district a closed campus or an open campus for high-school students during lunch hours?[d]**			
			Closed campus policy	Open campus policy
	Non-FTS participant	Number	171	66
		Percent	72%	28%
	FTS participant	Number	16	13
		Percent	55%	45%

[a]N=273
[b]Among non-FTS participants, 13 (5%) do not have a breakfast program
[c]N=274
[d]N=266

Table IV-2 divides results into 2 categories—Non-FTS participant and FTS participant. Table IV-2 illustrates all FTS participants have a breakfast program. Among FTS participants alone, there is not a stark difference between districts with summer

feeding programs and those without (55% and 45%). Also among FTS participants, there is not a large difference between districts with closed verses open campus policies (55% and 45%). However, there is a larger difference among non-FTS participants in regards to campus policy (72% and 28%).

Table IV-3. Free and reduced meals received according to district size

Number	Question						
6.	**What is the percentage of free and reduce breakfast and lunch programs your school district receives?[a]**						
	District size						
	< 500	500-1,000	1,000-2,500	2,500-5,000	5,000-1,000	> 10,000	All districts
< 25%	1%[b]	4%	9%	0%	67%	14%	4%[c]
25% to 50%	17%	22%	27%	38%	0%	14%	20%
51% to 75%	48%	54%	56%	46%	33%	43%	50%
> 75%	34%	20%	9%	15%	0%	29%	26%

[a]N=273
[b]One percent of the respondents with district size of 500 students or less reported less than 25% of the students receive free and reduced meals.
[c]Across all district sizes, 4% reported less than 25% of the students receive free and reduced meals.

The amount of free and reduced lunch reflects the amount of reimbursement the districts receive for the meals served to students. According to Table IV-3, only two district sizes (500 to 1,000 and 1,000 to 2,500) receive the majority of free and reduced lunch in the 51 to 75% range. All other district sizes receive varied percentages of free and reduced meal reimbursements. Across all district sizes, 50% of the districts receive reimbursements between 51 and 75 %.

Table IV-4. Type of FTS program participation

Number	Question			
8.	**Has your district participated in any of the following Farm-To-School Programs?[a]**			
	Pilot program	Statewide program	Working with local farmers	None of these
Number	16[b]	28	29	218
Percent	6%[b]	10%	11%	79%

[a]N=276
[b]Of the 276 collected responses, 16 respondents (6%) participated in the FTS pilot program.

For Question 8, (Table IV-4) respondents were able to check multiple answers if they had participated in more than one program. The majority of the responses fell under "none of these." Districts work more with local farmers independently and participate less in all FTS related program, comparatively. This means FTS informally exists without assistance from FTS programs.

Table IV-5 contains information on which distributors are used for produce and non-produce items. The reason why Thomas Brothers is listed twice is there are two distribution centers in Oklahoma and each serve different areas of Oklahoma. The list of distributors is meant to encompass the most widely used distributors in Oklahoma. If there is a food distributor not listed, the "other" option allows respondents to list the name of the distributor.

Table IV-5. Distributors for fresh produce and all items

Number	Question	
11.	**From what distributor(s) does your school district receive food items including any form of fruits and vegetables?[a]**	
	Small distributors	22%[b]
	U.S. Foods	15%
	Sysco	11%
	Grocery Stores	11%
	Tankersley Food Company	6%
	Tom E. Boggs	6%
	Mid-America	5%
	Performance Food Group	5%
	Ben E. Keith	5%
	Vinyards	3%
	Buddy's Produce	3%
	Tulsa Fruits & Produce	3%
	Southwest Food Service	2%
	Thomas Brothers-Tulsa	1%
	Okie Produce	1%
	Frontier Produce	1%
	Thomas Brothers-OKC	0%
12.	**Regarding the list below, which distributor(s) provide(s) fresh fruits and vegetables (i.e.: whole produce, cut, or bagged)?[c]**	
	Small distributors	18%
	U.S. Foods	13%
	Sysco	12%
	Grocery Stores	11%
	Tankersley Food Company	9%
	Ben E. Keith	6%
	Tom E. Boggs	5%
	Mid-America	4%
	Vinyards	4%
	Performance Food Group	4%
	Buddy's Produce	4%
	Tulsa Fruits & Produce	4%
	Southwest Food Service	2%
	Thomas Brothers-Tulsa	2%
	Okie Produce	1%
	Frontier Produce	1%
	Thomas Brothers-OKC	0%

[a]N=261
[b]N=Across all districts, 22% buy all food items from small distributors.
[c]N=257

The collected responses for both questions do not differ greatly among respondents, meaning many of the districts use the same distributor for both fresh produce and items other than fresh produce. Two categories along with two distribution companies ranked highest in usage among school districts for both produce and non-fresh items and are listed as small distributors, U.S. Foods, Sysco, and grocery stores.

Table IV-6. Produce delivery frequency according to FTS participation

Number	Question				
13.	**How frequently are fresh fruits and vegetables delivered to the school district?[a]**				
			Delivery frequency		
			Once a month	Twice a month	Once a week	Twice a week
	Non-FTS participant	Number	8[b]	12	178	33
		Percent	3%[b]	5%	77%	14%
	FTS participant	Number	0	0	23	5
		Percent	0%	0%	82%	18%

[a]N=259
[b]Among non-FTS participants, 8 (3%) have produce delivered once a month.

Table IV-6 shows most FTS participants (82%) and non-participants (77%) have produce delivered once a week. Because fresh produce has a short shelf life, delivery frequency is important to ensure that produce is fresh and of high quality. Because fresh fruits and vegetables start to perish after a week, it is likely that the majority of the districts have produce delivered once a week to maintain quality. In addition, refrigerated and cool storage space is limited in many kitchens, which may not allow many districts to store produce exceeding a week's worth of consumption. Having produce delivered weekly is possibly the most convenient and efficient option for schools.

None of the FTS participants has produce delivered once or twice a month.

Table IV-7. Fresh produce expenditure and percentage of fruits and vegetables precut and bagged

Number	Question						
16.	**On average, how much does the school district spend on fresh fruits and vegetables?[a]**						
			Percentage				
			<5%	5% to 15%	16% to 25%	26% to 50%	>50%
	Non-FTS participant	Number	85[b]	125	6	7	14
		Percent	36%[b]	53%	3%	3%	6%
	FTS participant	Number	7	15	0	2	4
		Percent	25%	54%	0%	7%	14%
17.	**What percentage of your fruits and vegetables are precut and bagged when received?[c]**						
			Percentage				
			10%	25%	50%	75%	100%
	Non-FTS participant	Number	85	62	44	28	4
		Percent	38%	28%	20%	13%	2%
	FTS participant	Number	7	12	2	7	0
		Percent	25%	43%	7%	25%	0%

[a]N=265
[b]Among non-FTS participants, 85 (36%) allocate less than 5% of their food budget to produce.
[c]N=251

According to Table IV-7, the majority of both participants and non-participants allocate less than 15% of their food budget to produce. Among non-participants, as the percentage of produce precut and bagged increases from 10 to 100%, the percentage of produce received decreases.

Question 17 is pertinent to FTS because the majority of the FTS products are received whole and unpackaged. According to the Oklahoma Department of Health

guidelines, cutting or processing produce in any form would be considered value-added processing. Businesses with value-added products are considered food processors and must meet specific food handling regulations (Oklahoma State Department of Health, 1991). Meeting these regulations can be costly and time consuming. Therefore, the majority of farmers that participate in supplying FTS products do not cut or package their produce. The majority of the districts receive 25% or less of their produce precut and bagged. It is common to see schools receive products ready for use. However, at some point a cost-savings line has to be drawn between the marginal benefit of precut and bagged produce and the marginal costs associated with using cafeteria labor for in-school cutting and processing. According to Table IV-7, not many schools have all of their produce precut and bagged. Districts with 2,500 or fewer students exhibit a lower percentage of precut and bagged produce.

Table IV-8. Beneficiaries and barriers to FTS

Number	Question					
19.	**In your opinion, who benefits from Farm-To-School? Please check all that apply.[a]**					
		Schools	Students	Farmers	Community	Other
	Number	135[b]	148	152	112	5
	Percent	74%[b]	81%	84%	62%	3%
21.	**What do you feel is the greatest barrier to a successful Farm-To-School program within your district?[c]**					
		Costs	Delivery	Seasonality	Health concerns	Availability of products	Other
	Number	18	107	24	13	25	12
	Percent	9%	54%	12%	7%	13%	6%

[a]N=182
[b]135 respondents (74%) stated schools benefit from FTS.
[c]N=199

Responding to Question 19, many respondents checked multiple answers stating that schools, students, farmers, and communities benefit from FTS. Surprisingly, the greatest perceived barrier to FTS is not costs; it is delivery. Of least concern are other barriers and health concerns. According to the results in Table IV-8, seasonality and availability of products are perceived as problems to FTS success as well.

Table IV-9. Factors influencing FTS participation

Factors	Not important									Very important
	1[a]	2	3	4	5	6	7	8	9	10
Freshness of product	1	0	0	0	9	0	3	17	17	145
	1%	0%	0%	0%	5%	0%	2%	9%	9%	76%
Consistency in product quality	1	0	0	1	14	2	8	15	35	117
	1%	0%	0%	1%	7%	1%	4%	8%	18%	61%
Expense	1	0	0	1	16	4	6	24	23	117
	1%	0%	0%	1%	8%	2%	3%	13%	12%	61%
Ease of participating in FTS program	2	0	1	0	17	6	9	24	27	106
	1%	0%	1%	0%	9%	3%	5%	13%	14%	55%
Ability to produce desired quality	2	0	2	2	13	5	12	33	28	95
	1%	0%	1%	1%	7%	3%	6%	17%	15%	49%
Convenience	1	1	1	1	17	5	11	35	33	86
	1%	1%	1%	1%	9%	3%	6%	18%	17%	45%
Ability to adjust timing of deliveries	2	2	2	1	20	9	10	30	34	83
	1%	1%	1%	1%	10%	5%	5%	16%	18%	43%
Delivery frequency	2	0	1	3	19	10	11	29	31	86
	1%	0%	1%	2%	10%	5%	6%	15%	16%	45%
Willingness to provide specific products	1	0	4	2	23	7	12	38	36	68
	1%	0%	2%	1%	12%	4%	6%	20%	19%	36%
Produce origin	2	2	5	3	25	14	17	35	22	66
	1%	1%	3%	2%	13%	7%	9%	18%	12%	35%

[a]N=195, measured on a likert scale, -top row of each factor is the number of responses, bottom row is the percentage of responses for each factor

In Table IV-9, factors affecting FTS participation received ratings on a likert scale from 1-10. The majority of the factors received ratings of 5 or above. The factors that received the greatest number of ratings of 10 were: freshness of product, consistency in product quality, and expense. The factor receiving the lowest number of ratings of 10 was Produce origin. It is imperative to point out that freshness of the product is important to food service directors; however, the origin of the product is not of high significance.

CHAPTER V

RESULTS

The results of the logistic model and the transportation cost template are included in this section.

Program participation

Table V-1. Chi-square statistic of FTS participation and independent variables

Item	Chi-square statistic	P-value
DISTRICT_SIZE	Continuity Adj. Chi-square	<0.0001
BREAKFAST	Continuity Adj. Chi-square	<0.0001
SUMMER_FEED	Chi-square	0.0258
CAMPUS_POLICY	Chi-square	0.0589
DELIVERY_FREQUENCY	Continuity Adj. Chi-square	0.2128
PRE_CUT_BAGGED	Chi-square	0.8382
FREE_REDUCED	Chi-square	0.2125
BUDGET	Continuity Adj. Chi-square	0.0803
DISTRIBUTOR_ALL	Chi-square	0.1477
DISTRIBUTOR_PRODUCE	Chi-square	0.0057
GROCERY_ALL	Continuity Adj. Chi-square	0.0883
GROCERY_PRODUCE	Continuity Adj. Chi-square	0.0924

Table V-1 lists 12 independent variables and their statistical significance with FTS participation according to the Chi-square statistic. Non-binary variables are modified as binary variables for the chi-square test. Of the 12 listed variables in Table 13, only four of the variables are statistically significant at the 5% level. This implies district size,

breakfast program participation, summer feeding, and distributor used for produce each have an effect on FTS participation.

Table V-2. Logit model results with FTS participation as the dependent variable

Variables	Estimate	Standard Error	Change in probability
Intercept**	-2.0781	0.9839	--
DISTRICT_SIZE*	0.000356	0.000133	0.0025%
FREE_REDUCED	-0.0162	0.015	-0.1140%
SUMMER_FEED	-0.0425	0.5861	-0.0030%
CAMPUS_POLICY	0.7957	0.5048	0.0566%
DISTRIBUTOR_PRODUCE**	-1.7005	0.7895	-0.1196%
BUDGET*	3.4032	1.325	0.2446%

*Indicates significance at the 0.01 level. **Indicates significance at the 0.05 level.

In the logistic model, *DISRICT_SIZE*, *DISTIBUTOR_PRODUCE*, and *BUDGET* were all statistically significant variables in determining FTS participation. In addition to the coefficients, marginal effects were calculated to measure the effects of change of explanatory variables on the probability of FTS participation; however, the percentages are small, making interpretation difficult.

In Table V-2, the signs on the coefficients reveal relationships between explanatory variables and FTS participation. *DISTRICT_SIZE* is positively related to FTS participation, implying that as size increases, probability of participation increases. *DISTIBUTOR_PRODUCE* is negatively related to FTS participation meaning that as a school district goes from using a large, common distributor to a smaller, less common distributor, probability of FTS participation decreases. As expected, *BUDGET* has a positive relationship with FTS participation. Additional availability in funds for fruits and vegetables allows for districts to participate in food programs like FTS and as the proportion of food budget for produce increases so does probability of FTS participation.

Table V-3. Change in probability of FTS participation with arbitrary changes

Variables	Amount increase	Change in probability
DISTRICT_SIZE *	1000	3.60%
PERCENT_FREE_REDUCED	10%	-1.30%
SUMMER_FEEDING	program-yes	-0.37%
CAMPUS_POLICY	policy-yes	9.60%
DISTRIBUTOR_PRODUCE **	small-yes	-7.80%
PERCENT_BUDGET_PRODUCE*	5%	2.00%

*Indicates significance at the 0.01 level. **Indicates significance at the 0.05 level.

Table V-3 differs from Table V-2 by the increments in which the explanatory variables change. Table V-3 has arbitrary changes in the *X* variable, which will add understanding to affects on the dependent variable. In Table V-3, *DISTRICT_SIZE* was increased by 1,000 students from its mean value of 1,397 students, which resulted in a 3.6% increase in probability of participation. The variable, *FREE_REDUCED* was increased from 63% to 73%, decreasing probability of participation by 1.3%. Probability of program participation decreases slightly when *SUMMER_FEEDING* is changed and a district goes from not having a summer feeding program to having one. FTS participation increases by 9.6% when *CAMPUS*_POLICY changes from a closed campus policy to an open campus policy. Using small, less common produce distributors instead of large, more common distributors decreases the probability of participation by 7.8%. Increasing the *BUDGET* variable by 5% from its mean value of 11% increases the probability of participation by 2%.

Transportation costs

The transportation cost template (see Appendix IV) was designed to assist agricultural producers in devising least cost distribution methods for fruits and vegetables

and allows them to evaluate and compare total cost sensitivity due to change in prices. The values used in the cost template were arbitrarily chosen and serve as an example for producers interested in FTS distribution. For a producer to compare transportation options, he would need to enter values in the template that pertain to a real case scenario for his operation.

The template has a total of four tabs, an introductory tab with brief directions and suggested readings, and three additional tabs for each possible delivery method: DD, WD, and ID. Each tab is similar with the exception of a few rows. The tabs have three main sections. The first section, General Information, contains information on the quantity of commodity, labor, distance, and fuel costs associated with transport. The second section, Vehicle Information, has information related to vehicles. The third section has the cost of distribution for each mile, trip, and unit of commodity. In addition to this section is an account of the farm gate margin of profit for the farmer per unit of commodity. The farm gate margin represents the value of the unit of produce at the farm.

Each year, the Internal Revenue Service (IRS) releases standard mileage rates for business expense deductions. The cost template provides the option of using the standard mileage rate or entering a different value. The standard mileage rate for business is based on an annual study of the fixed and variable costs of operating an automobile and is currently set at 55 cents per mile (IRS, 2008).

The template sections titled General Information and Vehicle Information contain estimated figures gathered from a myriad of sources. The following items discussed are included in the section General Information. The selling price of the unit, watermelon, is information provided by a watermelon farmer, Kevin Hughes, who cultivates the

watermelon provided for the FTS Statewide project (Hughes, Kirby, and Holcomb, 2009). According to Mr. Hughes, watermelon is delivered in crates with two watermelons in each crate; therefore, a unit of produce includes two watermelons. The price of labor refers to the labor costs of the truck driver. The delivery size, unloading time for each delivery, and number of deliveries per trip can be modified for individual analyses. For the Statewide FTS program, the delivery route begins in Hinton, Oklahoma, where the commodity is loaded, and then the truck travels to Oklahoma City and Tulsa. This distance is approximately 150 miles. The final item in the General Information section is fuel cost. Historical gas prices can be found online. Due to fluctuating gas prices, the current price for fuel was used.

Under the section, Vehicle Information, items related to vehicles such as fuel economy, tire and maintenance costs, and depreciation are listed. According to Barnes and Langworthy (2003), gas mileage for a straight truck (pickup or delivery van) is 8-9 miles per gallon (mpg). Tire costs differ according to vehicle type and size. The estimated life of a tire is 45,000 miles (Barnes and Langworthy, 2003). For a pickup, van, or a sport utility vehicle, a set of tires costs 1.2 cents per mile on extremely poor pavement quality and 1.0 cents per mile on smooth pavement conditions. There are estimated maintenance and repair costs for various vehicle types cited study by Barnes and Langworthy (2003).

Vehicle depreciation is function of age and use (miles driven). Depreciation for newer trucks may be spread equally across a number of years (straight-line method) or by the Modified Accelerated Cost Recovery System (MACRS) formula. Older trucks may depreciate very little as result of an additional year or a few extra thousand miles. The expected number of miles driven is derived through consideration of multiple items. The

distance the truck travels between Oklahoma City, Hinton, and Tulsa is short. The number of deliveries occurs only once or twice a week. Finally, watermelon, currently the main produce item distributed in the Oklahoma FTS program, can be harvested in Oklahoma from July through October; however, the academic year traditionally begins in August. Therefore, the schools are receiving watermelon for only three months in a year. For FTS distribution alone, the expected distance driven in a year is approximately 10,000 miles. The average speed of a truck can vary depending upon whether the vehicle is traveling on highways or city streets. For the purposes of this research, the speed of a truck will be an assumed 45 miles per hour. This value, along with all other values included in the transportation cost template, can be changed to mimic the conditions and prices producers face. For an illustration of the three delivery tabs within the cost template, please refer to Appendix IV.

Utilizing the cost information from the template, cost curves were constructed using a simulation program. Values for means, standard deviations, constants of variation, minimums, and maximums were simulated for each distribution scenario and iterations of cost values were calculated for distances varying from 25 miles to 150 miles. Two graphs were created with the simulated data, one illustrating per unit delivery cost and the other illustrating the farm gate margin. Similar to the transportation cost template, the results of the cost curves are subject to variations in price.

The distribution cost per unit of produce given the base scenario with general information and vehicle information fixed, is $1.04 for DD, $1.03 for WD, and $2.73 for ID. The distribution curves correspond with these distribution costs and illustrate the least costly transportation method for each unit delivered is WD, closely followed by DD. ID

is higher in costs due to the intermediary's charge per unit of service. The farmer absorbs this charge. If the number of deliveries made by the farmer increases from 2 to 10 or 15, the per unit cost of distribution will increase and exceed that of WD however, remaining lower than the cost of ID.

The farm gate margin or the net profit per unit for the producer, given the base scenario, is highest using DD, at $7.46. For WD and ID, the margin is $5.97 and $5.77, respectively. When the number of deliveries is increased to 10 and 15, the farm gate margin is still highest with DD at $7.19 and $7.02, respectively. Distribution costs increase when number of deliveries increases because labor costs are greater. An increase in the delivery route would affect all three scenarios similarly, increasing the cost of the entire trip, yet decreasing the cost per mile and decreasing the farm gate margin. These reported values are reflective of the information provided for the base scenario and any stated modifications. For the producer to decide which distribution method is least costly, the producer would need to provide cost information relevant to his operation.

Cost curves were generated based upon the base estimates used in the template. These estimates are subject to change and are reflective of given price information.

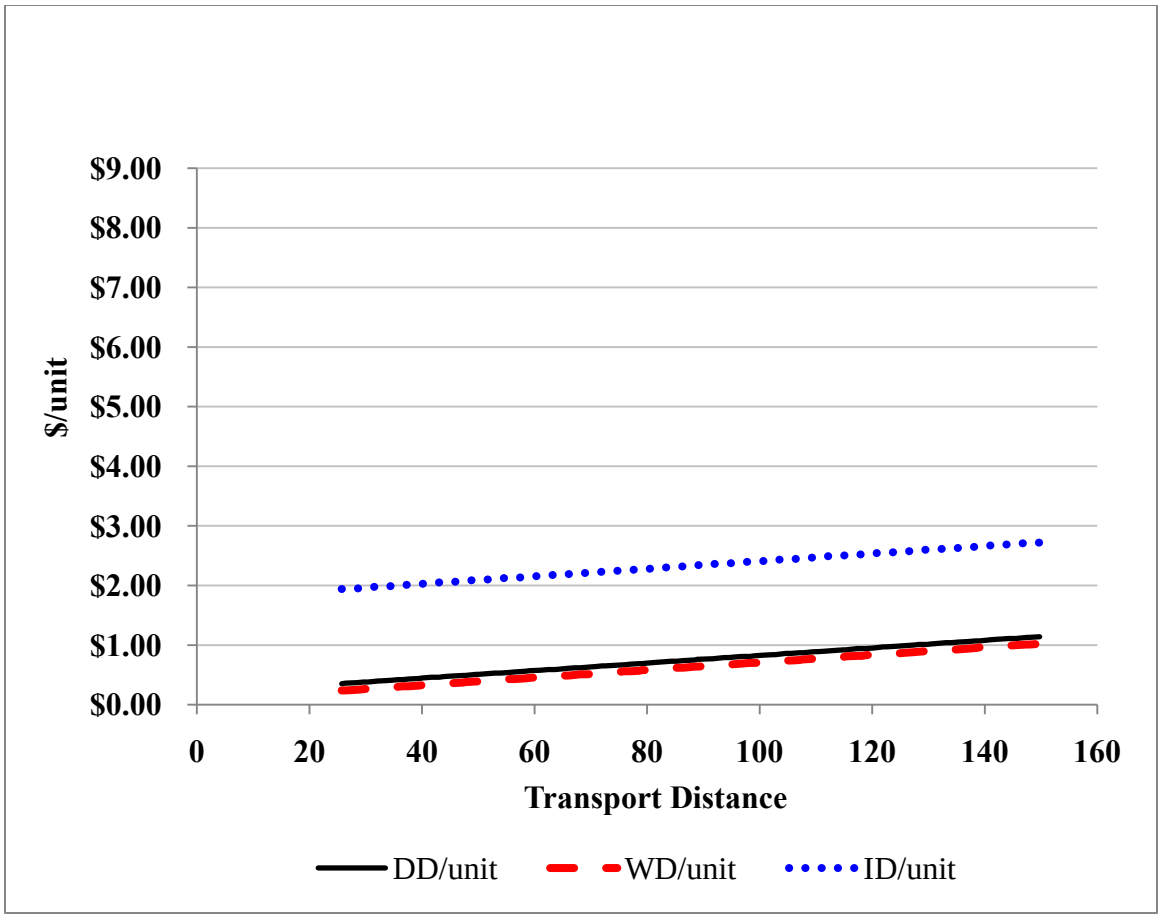

Figure V-1. Hypothetical per unit cost of different delivery methods for seedless watermelon

Subject to given price information, Figure V-1 illustrates WD as the least cost method of delivery. ID is the most costly method. Although the marginal cost decreases as distance increases, the total cost of transportation increases, hence the upward sloping curves. The per unit cost of delivery can decrease if the labor or fuel price decreases or if the number of delivered units increases.

Figure V-1 illustrates the per unit delivery costs for the various delivery methods. In the cost template, there are particular values that affect total cost of distribution. When the farmer delivers, the number of trips the farmer makes increases the unloading time and in turn increases labor. For the base scenario, unloading takes approximately 20

minutes per delivery. As the number of deliveries increases, so does the hours of driver labor. Depending upon the distances between the farm and drop-off points, the number of miles traveled or delivery route could potentially increase as well. If the delivery route increases, fuel costs increase. It is reasonable to believe that as the number of deliveries increases, distances will naturally increase, unless the school districts receiving FTS commodities are within close proximity. The cost factors that stay relatively constant within the cost template are those related to vehicles. It is assumed in the given example that tire costs, maintenance costs, fuel economy, and depreciation are the same for each delivery method.

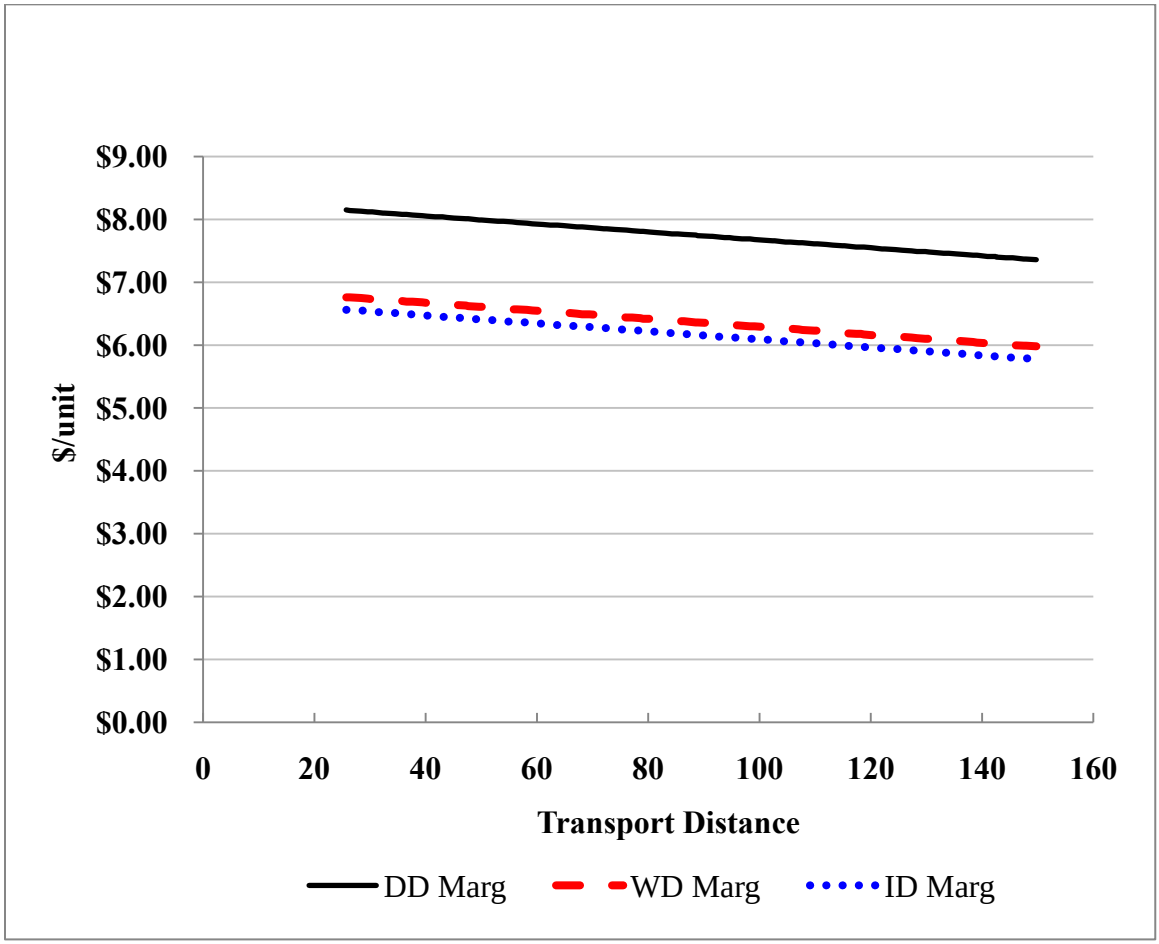

Figure V-2. Hypothetical farm gate margin for different delivery methods for seedless watermelon

Subject to given price information, Figure V-2 illustrates the greatest marginal profit is gained using DD and lowest with ID. As distance increases, total transportation cost increases and results in a downward sloping curve. The producer has incentive to deliver commodities as close as possible to the farm to decrease transportation costs and increase profit margins. For the farm gate margin to increase, the price of the product or the quantity sold needs to increase.

Figure V-2 shows a stark difference in farm gate margin between farmer delivery and the other two possibilities. The reasons for this are mainly due to the difference in selling price to the warehouse and the intermediary's charge per unit of delivery service. When the farmer delivers, the selling price per unit of produce is $8.50, whereas when the warehouse delivers, the selling price is only $7.00. If the farmer conducts delivery, he will be making an extra $1.50 per unit delivered which explains the apparent difference in the farm gate margin. For the scenario where the intermediary delivers, the farmer is charged $1.70 per unit of produce that is picked up at the farm. Though the selling price in this scenario is set at $8.50, the farmer is actually only receiving $6.80 per unit of produce after the intermediary's service charge is deducted. For the farmer, using an intermediary is least desirable because the farm gate margin per unit is lowest at $6.80 and most profitable with direct delivery (farm gate margin is $8.50) even when the number of trips increases. If the farmer does not object greatly to the amount of labor and time associated with the direct delivery method, then it may be the most preferred method. This analysis will assist a farmer when considering the comparative advantages of direct delivery and other delivery alternatives.

CHAPTER VI

CONCLUSIONS

States with strong local food initiatives have the potential for adoption of FTS programs. Identifying the school district characteristics associated with participation may help policy makers, food service directors, and farmers target their FTS programs towards school districts more likely to adopt FTS. Further, schools, farmers, and communities may benefit from the results of this research by minimizing distribution costs.

Assuming school personnel maximize expected utility, using a logit procedure, a binary choice model was specified to represent the dichotomous decision to participate in FTS. The probability of FTS participation was assumed to depend on factors such as district size, breakfast programs, summer feeding programs, campus policy during lunch hours, food distributors, and food budgets. The estimated model was then used to evaluate the response of a district having mean characteristics. Marginal effects were calculated to measure the effects of change in the explanatory variables on the probability of participation.

Overall, the results indicate that size, food distributors, and food budgets are associated with a district's participation in FTS more so than other food programs and campus policy. The percentage of free and reduced meals offered to the students is not likely to affect the adoption of a FTS program. Districts with high reimbursement rates

for free and reduced priced meals are not more likely to participate in FTS than those will low reimbursement rates. Schools with larger food budgets for produce, however, have the option to spend additional funds on fresh fruits and vegetables and are more likely to participate in FTS. Because food distributors play a large role in FTS participation, this information might be useful to farmers when determining whether to deliver produce directly or to contract a third party to distribute FTS commodities.

When considering the base scenario, in terms of distribution costs per trip, cost was highest when the farmer delivered. Per unit cost of distribution was highest when the intermediary delivered, while the farm gate margin was highest when the farmer delivered. Should farmers use direct delivery as a distribution method? This depends upon the specifications of delivery and the farmer's preferences. This study was conducted under controlled conditions with specific delivery routes, prices, and quantities determined by previous research on transportation costs and existing FTS distribution conditions. It is possible that different results could be found by changing values within the cost template.

Limitations of this research can be seen in the explanatory variables. The explanatory variables consisted of characteristics of districts; however, another possible proponent to FTS participation is access to information. All of the school personnel from districts officially participating in FTS have had contact with the Oklahoma FTS coordinator. Determining whether FTS programs were due to a charismatic organizer may be significant. In addition, it might have been useful to observe the opinions of food service and school personnel towards local food initiatives.

A recommendation for further research is applying the methods of this study to FTS programs in other states, which may assist the National FTS Network in establishing FTS programs. In addition, a study on willingness-to-pay for a FTS program may be of interest. This thesis is an attempt to establish and encourage additional research in the area of FTS.

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APPENDICES

Appendix I: Child Nutrition in Oklahoma Survey

Child Nutrition in Oklahoma

1. Default Section

This survey is undertaken by the Oklahoma Department of Education, Oklahoma State University, and the Oklahoma Department of Agriculture, Food & Forestry. The purpose of this survey is to gather information regarding Farm-To-School (FTS) program participation in Oklahoma. Please take a few minutes to fill out this survey. Your individual responses will remain private and only aggregate information will be reported. Your responses will be helpful towards our research. Thank you for your participation.

2. Background Information

1. Background Information

Name:
Title:
School:
Address:
City/Town:
State:
District:
Zip Code:
Email Address:
Phone Number:

3. General Questions

2. Please classify the school district population under one of the following categories:

- ◯ Less than 500
- ◯ 500-1000
- ◯ 1,000-2,500
- ◯ 2,500-5,000
- ◯ 5,000-10,000
- ◯ Greater than 10,000

3. On average, how many students does your district serve per day during the school year?

- ◯ Less than 500
- ◯ Between 500-1000
- ◯ 1000-2,500
- ◯ 2,500-5,000
- ◯ 5,000-10,0000
- ◯ 10,000 or more

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Child Nutrition in Oklahoma

4. Do your schools participate in breakfast programs? If so, how many students do you serve per day with the breakfast program?

- ◯ Less than 500
- ◯ 500-1,000
- ◯ 1,000-2,500
- ◯ 2,500-5,000
- ◯ 5,000-10,000
- ◯ 10,000 or more
- ◯ N/A

5. Do any of the schools within your district house a summer feeding program?

- ☐ Yes
- ☐ No

6. What is the percentage of free and reduced breakfast and lunch programs your school district receives?

7. Is your school district a closed campus or an open campus for high-school students during lunch hours?

- ◯ Open
- ◯ Closed

4. Farm-To-School

8. Has your district participated in any of the following Farm-To-School programs?

- ☐ The Farm-To-School Pilot Program in 2004-2005 during which seedless watermelons were distributed
- ☐ The Statewide Farm-To-School Program starting in 2006-Present
- ☐ Working with local farmers without Farm-To-School Assistance(working with farmers independently)
- ☐ None of these

9. When the district participated in FTS, what products did you receive from local farmers? Please list the products and the farmers you received them from.

Child Nutrition in Oklahoma

10. During what dates did you receive these products?

5. Produce

11. From what distributor(s) does your school district receive food items including any form of fruits and vegetables?

- ☐ Ben E. Keith
- ☐ Tankersley Food Company
- ☐ Tulsa Fruits & Produce
- ☐ Sysco
- ☐ Performance Food Group
- ☐ OKIE Produce
- ☐ Mid-America
- ☐ Thomas Brothers-OKC
- ☐ Vinyards
- ☐ U.S. Foods
- ☐ Thomas Brothers-Tulsa
- ☐ Frontier Produce
- ☐ Southwest Food service
- ☐ Buddy's Produce
- ☐ Tom E. Boggs, Inc.
- ☐ Other (please specify)

12. Regarding the list below, which distributor(s) provide(s) fresh fruits and vegetables (i.e.: whole produce, cut, or bagged)?

- ☐ Ben E. Keith
- ☐ Tankersley Food Company
- ☐ Tulsa Fruits & Produce
- ☐ Sysco
- ☐ Performance Food Group
- ☐ OKIE Produce
- ☐ Mid-America
- ☐ Thomas Brothers-OKC
- ☐ Vinyards
- ☐ U.S. Foods
- ☐ Thomas Brothers-Tulsa
- ☐ Frontier Produce
- ☐ Southwest Food service
- ☐ Buddy's Produce
- ☐ Tom E. Boggs, Inc.

Other (please specify)

13. How frequently are fresh fruits and vegetables delivered to the school district?

- ◯ Weekly
- ◯ Twice a week
- ◯ Monthly
- ◯ Twice a month

6. Budget Information

Child Nutrition in Oklahoma

14. On a monthly basis, how much does the school district spend on average on cafeteria food costs?

- ☐ $5,000 or less
- ☐ $5,000-$25,000
- ☐ $25,000-$75,000
- ☐ $75,000-$100,000
- ☐ $100,000-$150,000
- ☐ Greater than $150,000

15. On a monthly basis, how much does the school district spend on canned, dried or frozen fruits and vegetables?

- ◯ Less than $500
- ◯ $500-$2,500
- ◯ $2,500-$5,000
- ◯ $5,000-$8,000
- ◯ $8,000-$10,000
- ◯ Greater than $10,000

16. On a monthly basis, how much does the school district spend on **FRESH fruits and vegetables?**

- ◯ Less than $500
- ◯ $500-$2,500
- ◯ $2,500-$5,000
- ◯ $5,000-$8,000
- ◯ $8,000-$10,000
- ◯ Greater than $10,000

17. What percentage of your fruits and vegetables are precut and bagged when received?

◯ 10% ◯ 25% ◯ 50% ◯ 75% ◯ 100%

7. Opinions

Child Nutrition in Oklahoma

18. If you are currently participating in Farm-To-School, do you plan to continue to do so? If not, please state reasons why.

- ◯ Yes
- ◯ No
- ◯ If no, why:

19. In your opinion, who benefits from Farm-To-School? Please check all that apply.

- ☐ Schools
- ☐ Students
- ☐ Farmers
- ☐ Community
- ☐ Other (please specify):

20. Please rate the relative importance of the following service factors that may influence your participation in Farm-To-School using the following 1-10 scale: 1=Not important, 10=Very important.

	(1) Not Important	2	3	4	5	6	7	8	9	10 (Very Important)
Convenience	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Delivery Frequency	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Consistency in product quality	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Expense	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Freshness of product	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Ability to produce desired quality	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Ability to adjust timing of deliveries	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Willingness to provide specific products	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Ease of participating in the program	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Produce origin	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

21. What do you feel is the greatest barrier to a successful Farm-To-School program within your district?

- ◯ Costs
- ◯ Delivery
- ◯ Seasonality
- ◯ Health concerns
- ◯ Availability of products
- ◯ Other (please specify):

Child Nutrition in Oklahoma

22. Would you be interested in an in-house presentation on the Farm-To-School program that includes information on the purpose of the program, participation, and product availability?

◯ Yes ◯ No

23. Please share any additional comments.

24. Thank you for taking the time to fill out the survey. This information will be used for research purposes. Anonymity will be maintained for all responses. Only aggregate information will be reported. If you would like a copy of aggregate findings, please check the box below.

◯ Yes, I would like to receive aggregate information.

Appendix II: Oklahoma Distributor Questionnaire

Dear Distributor:

Please take a few minutes to complete this questionnaire regarding the Farm-To-School (FTS) program in Oklahoma. Because of your stature as a food distributor to Oklahoma schools, your input regarding locally grown versus non-locally grown produce is vital. Oklahoma State University, the Oklahoma Department of Agriculture, Food & Forestry, and the Oklahoma State Department of Education will collectively use this information to assess the potential for expanding the Farm-To-School program in the near future.

Your individual responses will remain private and only aggregate information will be reported. Thank you in advance for your time.

General questions related to business with schools

1) To how many school districts does your company distribute produce?

2) What percent of your total produce business is with schools?

3) Do you utilize different fee structures for schools compared to your non-school customers? If so, what is that difference?

4) When you provide a produce bid for a school, are you required to sell the produce at the bid price if the bid is for the year? For the month? For the week?

5) Distribution companies have certain documentation and requirements that farmers must follow to distribute produce through your company. What are those? For example, product liability insurance (how much), Good Agricultural Practice documentation? 3rd party certification? Others?

Questions related to locally grown products

6) How many of your school clientele specifically request local produce?

7) What type of delivery truck(s) does your company use for making deliveries to schools?

8) Are you currently back hauling any local produce back to your warehouse? Are you interested in doing so?

9) How does your company view the distribution fee of $1.50 per case for FTS produce? Do you think it should be raised? By how much?

10) Is the fee charged to cooperatives, brokers, and farmers for doing business with your company different for those out-of-state (e.g.: California) verses those in Oklahoma?

11) Are you currently buying produce from any local farmers for clients other than the FTS participants?

12) If you receive local produce other than for FTS, do you segregate the local from the other produce and promote as local?

13) Is your company looking to purchase more local produce?

14) What are the barriers/issues regarding local produce purchasing and what would make it easier for your company to distribute locally grown produce?

15) Are you interested in distributing FTS food products?

Appendix III: Farmer Questionnaire

Questionnaire for Farmer
Kevin Hughes
FTS Case study

Production

1) For the average farmer, how many lbs of watermelon does a farmer produce per acre each month? Each week?
2) For the average farmer, how many lbs of watermelon can be produced per acre for the month of August, September, October, and November?
3) How is your farm irrigated? Are there any special/additional farming techniques used on your farm?
4) Is your actual production more than what the usual farmer produces? (Please answer questions 1 and 2 in terms of your farm).

Consumer demographics

5) To what type of institutions do you sell your watermelons?
6) What percentage of your watermelon production is marketed in the Farm To School (FTS) program?
7) How many schools/districts are you supplying produce to?

Transportation

8) How are FTS products delivered from the farm to the school?
9) What types of vehicles are used?
10) Do you use third party distributors to transport your produce? What is the cost of using this entity?
11) Does transporting watermelon require refrigerated trucks?
12) What is the distance traveled?
13) How often are deliveries made each month? Each week?
14) Are they delivered on the same day?
15) Are they picked up from your farm?
16) Is there a central farm location near your farm and other watermelon farmers? What would you say the average distance between that central location and other farms be?
17) (should I ask about insurance and maintenance cost on their vehicles?)

Quantity/Capacity/Price

18) On average, how many lbs of watermelon are loaded onto a farm truck? What is the maximum capacity? What are these values for different types of trucks (med-size, or farm trucks with trailers semis)?
19) Are you able to consistently meet demand?
20) What product, at what price and quantities have you sold to schools?
21) Are you selling at, below, or above the standard price for watermelon?

Financial Feasibility

22) Is there a break-even point for you to deliver to a distributor? In other words, what is the minimum numbers of case you need to deliver to a distributor in 1 drop to make it profitable?
23) Is there a charge for delivery from the distributor when you drop a load for FTS?
24) Is this project economically viable for your farm?

Opinion and General Business

25) Has Farm to School helped you get any additional business with distributors separate from the FTS program?
26) What are some major problems/barriers you see with a FTS program?
27) What are the positive aspects of FTS for you as a grower?

Appendix IV: Farm-To-School Distribution Cost Template

Farm-To-School Distribution Cost Template

Rodney B. Holcomb, Professor
Anh Vo, Former Graduate Research Assistant
Oklahoma State University
Robert M. Kerr Food & Agricultural Products Center
Department of Agricultural Economics

This template was designed to assist agricultural producers marketing fruits and vegetables through a state-supported Farm-To-School (FTS) program. The template allows producers to assess and compare the costs of alternative transportation/distribution methods and determine their farm-level returns for each unit of produce marketed through the FTS program. It also provides producers an opportunity to examine the sensitivity of their chosen distribution method to changes in a number of cost factors and/or a change in market price for their produce.

Users of the template are requested to provide the appropriate information in the **green** cells. The template will generate the per-unit costs for transporting produce a stated distance.

NOTE: The true costs of transportation for fruits and vegetables vary greatly by the vehicles employed, the use of refrigeration (if necessary), fuel prices, and distance traveled. Long-haul versus short-haul costs, back-haul versus no back-haul, the number of delivery points, and even road conditions all have large impacts on distribution costs. Although some of these factors are addressed in the template, users of the template are also directed to review literature related to operational costs in the trucking industry. Some useful references (in alphabetical order) include the following:

Barnes, G., and P. Langworthy. (June 2003). "The Per-Mile Costs of Operating Automobiles and Trucks." Minnesota Department of Transportation, Office of Research Services, Report 2003-19. Authors are faculty with the Humphrey Institute of Public Affairs, University of Minnesota, Minneapolis, MN. Available at http://www.lrrb.org/pdf/200319.pdf, accessed July 9, 2009.

Tolliver, D., and A. Dybing. (2009). "Highway User Costs at 2008 Prices." Transportation Research Board Annual Meeting 2009 paper #09-2831, Transportation Research Board, Washington, D.C. The paper may be ordered at http://pubsindex.trb.org/orderform.html.

US Dept. of Agriculture, Agricultural Marketing Service (USDA-AMS). Go to http://www.ams.usda.gov and click on "Market News and Transportation Data". The site provides links to transportation data, along with PDF issues of *Agricultural Refrigerated Truck Quarterly*.

US Dept. of the Treasury, Internal Revenue Service (IRS). *Standard Mileage Rates.* Each year the IRS releases standard mileage rates for business expense deductions at http://www.irs.gov. The 2009 mileage rates are available at http://www.irs.gov/newsroom/article/0,,id=200505,00.html, accessed July 9, 2009.

Direct Delivery by Farmer-Owned Truck

General Information

Commodity to be delivered	watermelons
Commodity unit (case, pound, carton, etc.)	2-count
Selling price per unit (what schools pay)	$8.50
Delivery size, in units	100
Labor rate ($/hr)	$10.00
Unloading time per delivery (minutes)	20
Number of deliveries per trip	2
Delivery route (miles, round trip)	150
Fuel cost (gas or diesel, $/gal)	$2.39

Vehicle Information

Farm truck fuel economy (mpg)	9.00
Vehicle tire costs (set of tires)	$575.00
Vehicle tire life (thousand miles)	45,000
Expected maint./repair expenses this year	$1,500.00
Expected depreciation this year	$2,500.00
Expected miles driven this year	10,000
Avg speed when making deliveries (mph)	45

Enter "1" if using the IRS standard mileage rate (otherwise leave blank)	
Current IRS standard mileage rate ($/mile)	$ 0.55

Operating Costs per Mile

Fuel costs	$0.02
Maintenance/Repair	$0.15
Tires	$0.01
Depreciation	$0.25
Labor	$0.27
Total Operating Costs per Mile	**$0.70**

Total Operating Costs per Trip **$104.31**

Distribution Cost per Unit of Produce **$1.04** **per** **2-count**

"Farm Gate" Margin per Unit **$7.46** **per** **2-count**

Delivery to a Warehouse*

General Information

Commodity to be delivered	watermelons
Commodity unit (case, pound, carton, etc.)	2-count
Distributor purchase price	$7.00
Delivery size, in units	100
Labor rate ($/hr)	$10.00
Unload/waiting time at warehouse (min)	30
Delivery route (miles, round trip)	150
Fuel cost (gas or diesel, $/gal)	$2.39

Vehicle Information

Vehicle fuel economy (mpg)	9.00
Vehicle tire costs (set of tires)	$575.00
Vehicle tire life (thousand miles)	45,000
Expected maint./repair expenses this year	$1,500.00
Expected depreciation this year	$2,500.00
Expected miles driven this year	10,000
Avg speed when making deliveries (mph)	45

Enter "1" if using the IRS standard mileage rate		
(otherwise leave blank)		
Current IRS standard mileage rate ($/mile)	$0.55	
Operating Costs per Mile		
Fuel costs	$0.02	
Maintenance/Repair	$0.15	
Tires	$0.01	
Depreciation	$0.25	
Labor	$0.26	
Total Operating Costs per Mile	**$0.68**	
Total Operating Costs per Trip	**$102.64**	
Distribution Cost per Unit of Produce	**$1.03**	**per 2-count**
"Farm Gate" Margin per Unit	**$5.97**	**per 2-count**

*A warehouse, or large distributor, takes ownership of the produce and negotiates both pricing and delivery specifications with the schools.

Delivery Using an Intermediary*

General Information

Commodity to be delivered	watermelons
Commodity unit (case, pound, carton, etc.)	2-count
Selling price per unit (what schools pay)	$8.50
Intermediary's charge per unit for service	$1.70
Delivery size, in units	100
Labor rate ($/hr)	$10.00
Unload/waiting time at intermediary (min)	30
Delivery route (miles, round trip)	150
Fuel cost (gas or diesel, $/gal)	$2.39

Vehicle Information

Vehicle fuel economy (mpg)	9.00
Vehicle tire costs (set of tires)	$575.00
Vehicle tire life (thousand miles)	45,000
Expected maint./repair expenses this year	$1,500.00
Expected depreciation this year	$2,500.00
Expected miles driven this year	10,000
Avg speed when making deliveries (mph)	45

Enter "1" if using the IRS standard mileage rate			
(otherwise leave blank)			
Current IRS standard mileage rate ($/mile)	$ 0.55		
Farmer's Operating Costs			
Fuel costs	$0.02		
Maintenance/Repair	$0.15		
Tires	$0.01		
Depreciation	$0.25		
Labor	$0.26		
Farmer's Operating Costs per Mile	**$0.68**		
Farmer's Operating Costs per Trip to Intermed.	**$102.64**		
Distribution Cost per Unit of Produce	**$2.73**	**per**	**2-count**
"Farm Gate" Margin per Unit	**$5.77**	**per**	**2-count**

*An intermediary may be another producer, a broker, a small contract producer distributor, or a cooperatively-operated distribution network. If the intermediary picks up the produce at the farm, then only the intermediary's charge for services is needed.

Appendix V: SAS Code

FTS5_25 Code

```
Dm'log;clear;output;clear;';
PROC IMPORT OUT= WORK.AnhFinal
 DATAFILE= "C:\FarmToSchoolORganized\4 FTS\SurveySasStuff\New
Data5_22DoNotChangedoc.xls"
 DBMS=EXCEL REPLACE;
 SHEET="Sheet1$";
 GETNAMES=YES;
 MIXED=NO;
 SCANTEXT=YES;
 USEDATE=YES;
 SCANTIME=YES;
RUN;
data CompleteSurvey; set anhfinal (drop=ID StartDate EndDate IPAddress
EmailAddressSent
FirstName LastName CustomData Name Title School Address City_Town State
District Zip_Code
EmailAddress PhoneNumber Population
 OtherProg ProductsReceived DateReceivedF_V
OtherDistributorAnyF_V OtherDist
 OtherDistributorFreshF_V2 OtherFreshDist
IfNoWhy OtherBeneficiaries OtherBarrier Comments website);

/*Trying to use reduced and free info and convert into groups*/;
**newpercentreduced=0;
/* think this is a bias so will leave it out*/;
if((percentreduced>0) & ( Percentreduced <= 25)) then newpercentreduced=1;
if ((Percentreduced>25) & (Percentreduced<=50)) then newpercentreduced=2;
if ((Percentreduced>50) & (Percentreduced<=75)) then newpercentreduced=3;
if Percentreduced >75 then newpercentreduced=4;

/*Trying to get rid of zeros*/;
if Pilot= 0 then pilot= .;
if Statewide= 0 then statewide= .;
if LocalFarmers=0 then localfarmers=.;
if BenEKeith=0 then BenEKeith=.;
if Sysco=0 then Sysco=.;
if MidAmerica=0 then midamerica=.;
if USFoods=0 then USFoods=.;
if SouthwestFoodservice=0 then SouthwestFoodservice=.;
if Tankersley=0 then Tankersley=.;
if PerformanceFdGroup=0 then PerformanceFdGroup=.;
if ThomasBrothersOKC=0 then ThomasBrothersOKC=.;
if ThomasBrothersTulsa=0 then ThomasBrothersTulsa=.;
if BuddysProduce=0 then BuddysProduce=.;
```

```
if TulsaFruits=0 then TulsaFruits=.;
if OKIEProduce=0 then OKIEProduce=.;
if Vinyards=0 then Vinyards=.;
if FrontierProduce=0 then FrontierProduce=.;
if TomEBoggs=0 then TomEBoggs=.;

if BenEKeith2=0 then BenEKeith2=.;
if Sysco2=0 then Sysco2=.;
if MidAmerica2=0 then MidAmerica2=.;
if USFoods2=0 then USFoods2=.;
if SouthwestFoodservice2=0 then SouthwestFoodservice2=.;
if Tankersley2=0 then Tankersley2=.;
if PerformanceFdGroup2=0 then PerformanceFdGroup2=.;
if ThomasBrothersOKC2=0 then ThomasBrothersOKC2=.;
if ThomasBrothersTulsa2=0 then ThomasBrothersTulsa2=.;
if BuddysProduce2=0 then BuddysProduce2=.;
if TulsaFruits2=0 then TulsaFruits2=.;
if OKIEProduce2=0 then OKIEProduce2=.;
if Vinyards2=0 then Vinyards2=.;
if FrontierProduce2=0 then FrontierProduce2=.;
if TomEBoggs2=0 then TomEBoggs2=.;

if ContinuingFTS=999 then ContinuingFTS=.;

if Grocery_AllFoods=0 then Grocery_AllFoods=.;
if Grocery_FreshStore=0 then Grocery_FreshStore=.;

if Schools=0 then Schools=.;
if Students=0 then Students=.;
if Farmers=0 then Farmers=.;
if Community=0 then Community=.;
if ResultsRequest=0 then ResultsRequest=.;

if grocer1=999 then grocer1=.;
if grocer2=999 then grocer2=.;


/*Putting deliveryfreq in order*/;
/* from twice a week, once a week,twice a month, to once a month*/;
if deliveryfrequency=2 then deliveryfreq=8;
 if deliveryfrequency=1 then deliveryfreq=4;
 if deliveryfrequency=4 then deliveryfreq=2;
 if deliveryfrequency=3 then deliveryfreq=1;

 /*Putting FTS participation into binary form*/;
if ((pilot=1) & (statewide=2))
or (pilot=1)or (statewide=2) then FTSpart=1;
if (noprogs=4) or ((noprogs=4) & (localfarmers=3)) or (localfarmers=3) then
FTSpart=0;

/*trying to have all distributors together for non-fresh*/;
if benekeith=1 then distributor=1;
if sysco=2 then distributor=2;
if midamerica=3 then distributor=3;
if usfoods=4 then distributor=4;
```

```
if southwestfoodservice=5 then distributor=5;
if tankersley=6 then distributor=6;
if performanceFdGroup=7 then distributor=7;
if thomasbrothersOKC=8 then distributor=8;
if ThomasBrothersTulsa=9 then distributor=9;
if buddysproduce=10 then distributor=10;
if tulsafruits=11 then distributor=11;
if Okieproduce=12 then distributor=12;
if vinyards=13 then distributor=13;
if frontierproduce=14 then distributor=14;
if TomEboggs=15 then distributor=15;
if SmallDistAll=17 then distributor=17;
if Grocery_AllFoods=18 then distributor=18;

/*for fresh alone*/;
if BenEKeith2=1 then freshdistributor=1;
if Sysco2=2 then freshdistributor=2;
if MidAmerica2=3 then freshdistributor=3;
if USFoods2=4 then freshdistributor=4;
if SouthwestFoodservice2=5 then freshdistributor=5;
if Tankersley2=6 then freshdistributor=6;
if PerformanceFdGroup2=7 then freshdistributor=7;
if ThomasBrothersOKC2=8 then freshdistributor=8;
if ThomasBrothersTulsa2=9 then freshdistributor=9;
if BuddysProduce2=10 then freshdistributor=10;
if TulsaFruits2=11 then freshdistributor=11;
if OKIEProduce2=12 then freshdistributor=12;
if Vinyards2=13 then freshdistributor=13;
if FrontierProduce2=14 then freshdistributor=14;
if TomEBoggs2=15 then freshdistributor=15;
if Small_FreshDist=17 then freshdistributor=17;
if Grocery_FreshStore=18 then freshdistributor=18;

*taking distributor and freshdist and putting into categories frequently small
dist vs big*;
if distributor=1 then commondistributor=0;
if distributor=2 then commondistributor=0;
if distributor=3 then commondistributor=0;
if distributor=4 then commondistributor=0;
if distributor=5 then commondistributor=0;
if distributor=6 then commondistributor=0;
if distributor=7 then commondistributor=0;
if distributor=8 then commondistributor=0;
if distributor=9 then commondistributor=0;
if distributor=10 then commondistributor=0;
if distributor=11 then commondistributor=0;
if distributor=12 then commondistributor=0;
if distributor=13 then commondistributor=0;
if distributor=14 then commondistributor=0;
if distributor=15 then commondistributor=0;
if distributor=17 then commondistributor=1;
if distributor=18 then commondistributor=1;

if freshdistributor=1 then commonfrdistributor=0;
if freshdistributor=2 then commonfrdistributor=0;
```

```
if freshdistributor=3 then commonfrdistributor=0;
if freshdistributor=4 then commonfrdistributor=0;
if freshdistributor=5 then commonfrdistributor=0;
if freshdistributor=6 then commonfrdistributor=0;
if freshdistributor=7 then commonfrdistributor=0;
if freshdistributor=8 then commonfrdistributor=0;
if freshdistributor=9 then commonfrdistributor=0;
if freshdistributor=10 then commonfrdistributor=0;
if freshdistributor=11 then commonfrdistributor=0;
if freshdistributor=12 then commonfrdistributor=0;
if freshdistributor=13 then commonfrdistributor=0;
if freshdistributor=14 then commonfrdistributor=0;
if freshdistributor=15 then commonfrdistributor=0;
if freshdistributor=17 then commonfrdistributor=1;
if freshdistributor=18 then commonfrdistributor=1;

*changing percentage bagged into numbers*;
if percentagebaggedcut=1 then producebaggedcut=10;
if percentagebaggedcut=2 then producebaggedcut=25;
if percentagebaggedcut=3 then producebaggedcut=50;
if percentagebaggedcut=4 then producebaggedcut=75;
if percentagebaggedcut=5 then producebaggedcut=100;

*trying to fill in blanks for cafecost by putting in averages for each size*;
**go back and find the right numbers*;
**done!*;
if ((cafecost=.) & (districtsize<500)) then cafecost=9339.29;
if ((cafecost=.) & ((districtsize>=500) &(districtsize<1000))) then
cafecost=19234.69;
if ((cafecost=.) & ((districtsize>=1000) & (districtsize<2500))) then
cafecost=31875.00;
if ((cafecost=.) & ((districtsize>=2500)& (districtsize<5000))) then
cafecost=69375.00;
if ((cafecost=.) & ((districtsize>=5000) & (districtsize<10000))) then
cafecost=63333.33;
if ((cafecost=.) & (districtsize>=10000)) then cafecost=139583.33;

if districtsize<500 then distsizegroup=1;
if ((districtsize>=500) &(districtsize<1000))then distsizegroup=2;
if ((districtsize>=1000) & (districtsize<2500))then distsizegroup=3;
if ((districtsize>=2500)& (districtsize<5000)) then distsizegroup=4;
if ((districtsize>=5000) & (districtsize<10000)) then distsizegroup=5;
if (districtsize>=10000) then distsizegroup=6;

/*Turning Breakfast into binary*/;
if ((breakfast>0)&(breakfast <= 6)) then BreakfastPart=1;
if (breakfast =7) then BreakfastPart=0;

*putting breakfast into a continuous var*;
if breakfast=1 then breakfastp=250;
if breakfast=2 then breakfastp=1250;
if breakfast=3 then breakfastp=1750;
if breakfast=4 then breakfastp=3750;
if breakfast=5 then breakfastp=7500;
if breakfast=6 then breakfastp=10000;
```

```
if breakfast=7 then breakfastp=0;


if otherbene=0 then otherbene=.;

proc print data=completesurvey;
var grocer1 grocer2;
run;
/*Getting the means for cafecosts that are missing for each size*/;
*proc freq data=completesurvey;
*tables distsizegroup*cafecost;
*run;

data Ratios; set completesurvey;
if cafecost=1 then totalcost=2500;
if cafecost=2 then totalcost=15000;
if cafecost=3 then totalcost=50000;
if cafecost=4 then totalcost=87500;
if cafecost=5 then totalcost=125000;
if cafecost=6 then totalcost=150000;

if freshexpenses2=1 then fresh=250;
if freshexpenses2=2 then fresh=1500;
if freshexpenses2=3 then fresh=3750;
if freshexpenses2=4 then fresh=6500;
if freshexpenses2=5 then fresh=9000;
if freshexpenses2=6 then fresh=10000;

if cafecost=9339.29 then totalcost=9339.29;
if cafecost=19234.69 then totalcost=19234.69;
if cafecost=31875.00 then totalcost=31875.00;
if cafecost=69375.00 then totalcost=69375.00;
if cafecost=63333.33 then totalcost=63333.33;
if cafecost=139583.33 then totalcost=139583.33;
*/delete obvious outliers/*;
if ((freshexpenses2=3) & (cafecost=1)) then delete;

percentagefresh=fresh/totalcost;
proc print data=Ratios(obs=276);
var fresh totalcost percentagefresh;
run;
/*we put the word descending p. 18 to predict the highest value of the
dependent variable*/;
*Proc Logistic tells us the how the likelyhood variable affects Y*"how all
vars together affect model*;
*this model will have as many *discrete variables as possible*;

*possibly put distributor into sizes or even most used*;
* all possible variables: breakfastp breakfast summerfeeding population
cntpopulation newpercentreduced percentreduced newdelivery
openclosed commondistributor commonfrdistributor percentbaggedcut
percentagefresh continuingfts*;

proc logistic data=ratios descending;
title "Model 1: Y affected by all vars";
```

```
model FTSpart=districtsize percentreduced breakfastp summerfeeding Openclosed
deliveryfreq
commondistributor commonfrdistributor producebaggedCut percentagefresh;
run;

data percentfreshgroups; set ratios (obs=276);
if ((percentagefresh>0) &(percentagefresh<.05)) then prcntfrsh='1';
if ((percentagefresh>=.05) & (percentagefresh<.15)) then prcntfrsh='2';
if ((percentagefresh>=.15) & (percentagefresh<.25)) then prcntfrsh='3';
if ((percentagefresh>=.25) & (percentagefresh<.50)) then prcntfrsh='4';
if (percentagefresh>=.5) then prcntfrsh='5';
run;

proc print data=percentfreshgroups (obs=276) ;
var prcntfrsh;
run;

/*Is multicollinearity an issue?*/;
proc corr data=ratios;
var districtsize percentreduced breakfastp summerfeeding Openclosed
deliveryfreq
commondistributor commonfrdistributor producebaggedCut percentagefresh; with
FTSpart;
run;

proc corr data=ratios;
var districtsize percentreduced breakfastp summerfeeding Openclosed
deliveryfreq
commondistributor commonfrdistributor producebaggedCut percentagefresh
FTSpart;
run;
*due to results of this proc corr, believe should leave out commondist and
breakfastp, correlated.;

/*proc reg will tell us if they are correlated for sure*/;
proc reg data=ratios;
model FTSpart=districtsize percentreduced breakfastp summerfeeding Openclosed
deliveryfreq
commondistributor commonfrdistributor producebaggedCut percentagefresh/tol
vif;
run;

/*tried to pick up the problem with distributors but this proc didn't find
much,leave it out*;
proc logistic des data=ratios;
model FTSpart=districtsize percentreduced breakfastp summerfeeding Openclosed
deliveryfreq
commondistributor commonfrdistributor producebaggedCut percentagefresh;
output out=a pred=phat;
data b; set a;
w=phat*(1-phat);
proc reg data=b;
weight w;
model FTSpart=districtsize percentreduced breakfastp summerfeeding Openclosed
deliveryfreq
```

```
commondistributor commonfrdistributor producebaggedCut percentagefresh/tol
vif;
run;

/*Now will run it with less vars */;
proc logistic data=ratios des;
title "Model 2: FTS Participation and Less Vars";
model FTSpart=districtsize percentreduced summerfeeding Openclosed
commonfrdistributor percentagefresh;
run;
proc logistic data=ratios des;
model FTSpart=districtsize percentreduced summerfeeding Openclosed
grocer2 percentagefresh;
run;

*this will be my final model, only 2 are sig but will be interesting to
discuss;
proc logistic data=ratios des;
model FTSpart=districtsize percentreduced summerfeeding Openclosed
commonfrdistributor percentagefresh;
run;
/*Table1:*/;
proc freq data=ratios (obs=276);
tables Distsizegroup*(FTSpart breakfastpart summerfeeding openclosed);
run;
/*Table 2: delivery frequency alone*/;
proc freq data=ratios(obs=276);
tables deliveryfreq;run;
/*Table 2 & 3 & 4*/;
proc freq data=ratios(obs=276);
tables distsizegroup*(deliveryfreq studentsserveddaily producebaggedcut); run;
/*Table 4: wait for new data from Jake*/;
proc freq data=ratios(obs=276);
tables distsizegroup*(newpercentreduced); run;
/*Table 5 & 6*/;
proc freq data=ratios(obs=276);
tables Distsizegroup*(distributor freshdistributor); run;
/*Table 7: districtsize alone*/;
proc freq data=ratios(obs=276);
tables distsizegroup;run;
/*Table 8 & 9: Students served daily and FTS progs alone*/;
proc freq data=ratios(obs=276);
tables studentsserveddaily pilot statewide localfarmers noprogs;run;
/*Table 10: Beneficiaries alone*/;
proc freq data=ratios(obs=276);
tables Schools Students Farmers community otherbene; run;
/*Table 11,12 & 13: Barrier*/;
proc freq data=ratios(obs=276);
tables barrier in_house resultsrequest;run;
/*Table 14*/;
data factors; set ratios;
if convenience<=8 then convrank=1;
if convenience>8 then convrank=2;
if DeliveryImportance<=8 then delivrank=1;
if DeliveryImportance>8 then delivrank=2;
```

```
if Consistency<=8 then consistrank=1;
if Consistency>8 then consistrank=2;
if Expense<=8 then expenserank=1;
if Expense>8 then expenserank=2;
if Freshness<=8 then Freshnessrank=1;
if Freshness>8 then Freshnessrank=2;
if ProductQuality<=8 then pqrank=1;
if ProductQuality>8 then pqrank=2;
if AdjustDelivery<=8 then adjustrank=1;
if AdjustDelivery>8 then adjustrank=2;
if SpecificProducts<=8 then specrank=1;
if SpecificProducts>8 then specrank=2;
if Ease<=8 then Easerank=1;
if Ease>8 then Easerank=2;
if ProduceOrigin<=8 then Originrank=1;
if ProduceOrigin>8 then Originrank=2;
proc freq data=factors(obs=276);
tables convrank delivrank consistrank expenserank freshnessrank pqrank
adjustrank specrank
easerank originrank; run;
*************************************************************************;

/*Table Blah2: districtsize and percentage fresh*/;
proc freq data=percentfreshgroups(obs=276);
tables distsizegroup*prcntfrsh;run;
*************************************************************************/*N
ow work on FTS freq tables*/;
/*Table 15 All Vars against FTSpart*/;
proc freq data=percentfreshgroups(obs=276);
tables FTSpart*(distsizegroup newpercentreduced breakfastp summerfeeding
Openclosed deliveryfreq
commondistributor commonfrdistributor producebaggedCut prcntfrsh); run;
proc means data=ratios(obs=276);
title "for cont vars";
var districtsize percentreduced breakfastp summerfeeding Openclosed
deliveryfreq
commondistributor commonfrdistributor producebaggedCut percentagefresh ftspart
grocer1 grocer2;run;
/*Table 14*/;
proc freq data=percentfreshgroups(obs=276);
tables FTSpart*breakfastpart; run;

proc freq data=percentfreshgroups(obs=276);
tables FTSpart*( newpercentreduced prcntfrsh breakfastpart) ; run;
```

Chi-square Code

```
Dm'log;clear;output;clear;';
PROC IMPORT OUT= WORK.AnhFinal
 DATAFILE= "C:\FarmToSchoolORganized\4 FTS\SurveySasStuff\New
Data5_22DoNotChangedoc.xls"
 DBMS=EXCEL REPLACE;
 SHEET="Sheet1$";
 GETNAMES=YES;
 MIXED=NO;
 SCANTEXT=YES;
```

```
 USEDATE=YES;
 SCANTIME=YES;
RUN;
data CompleteSurvey; set anhfinal (drop=ID StartDate EndDate IPAddress
EmailAddressSent
FirstName LastName CustomData Name Title School Address City_Town State
District Zip_Code
EmailAddress PhoneNumber Population
 OtherProg ProductsReceived DateReceivedF_V
OtherDistributorAnyF_V OtherDist
 OtherDistributorFreshF_V2 OtherFreshDist
IfNoWhy OtherBeneficiaries OtherBarrier Comments website);

/*Trying to use reduced and free info and convert into groups*/;
**newpercentreduced=0;
/* think this is a bias so will leave it out*/;
if Percentreduced <= 25 then newpercentreduced=1;
if ((Percentreduced>25) & (Percentreduced<=50)) then newpercentreduced=2;
if ((Percentreduced>50) & (Percentreduced<=75)) then newpercentreduced=3;
if Percentreduced >75 then newpercentreduced=4;

/*Trying to get rid of zeros*/;
if Pilot= 0 then pilot= .;
if Statewide= 0 then statewide= .;
if LocalFarmers=0 then localfarmers=.;
if BenEKeith=0 then BenEKeith=.;
if Sysco=0 then Sysco=.;
if MidAmerica=0 then midamerica=.;
if USFoods=0 then USFoods=.;
if SouthwestFoodservice=0 then SouthwestFoodservice=.;
if Tankersley=0 then Tankersley=.;
if PerformanceFdGroup=0 then PerformanceFdGroup=.;
if ThomasBrothersOKC=0 then ThomasBrothersOKC=.;
if ThomasBrothersTulsa=0 then ThomasBrothersTulsa=.;
if BuddysProduce=0 then BuddysProduce=.;
if TulsaFruits=0 then TulsaFruits=.;
if OKIEProduce=0 then OKIEProduce=.;
if Vinyards=0 then Vinyards=.;
if FrontierProduce=0 then FrontierProduce=.;
if TomEBoggs=0 then TomEBoggs=.;

if BenEKeith2=0 then BenEKeith2=.;
if Sysco2=0 then Sysco2=.;
if MidAmerica2=0 then MidAmerica2=.;
if USFoods2=0 then USFoods2=.;
if SouthwestFoodservice2=0 then SouthwestFoodservice2=.;
if Tankersley2=0 then Tankersley2=.;
if PerformanceFdGroup2=0 then PerformanceFdGroup2=.;
if ThomasBrothersOKC2=0 then ThomasBrothersOKC2=.;
if ThomasBrothersTulsa2=0 then ThomasBrothersTulsa2=.;
if BuddysProduce2=0 then BuddysProduce2=.;
if TulsaFruits2=0 then TulsaFruits2=.;
if OKIEProduce2=0 then OKIEProduce2=.;
if Vinyards2=0 then Vinyards2=.;
if FrontierProduce2=0 then FrontierProduce2=.;
```

```
if TomEBoggs2=0 then TomEBoggs2=.;

if ContinuingFTS=999 then ContinuingFTS=.;

if Grocery_AllFoods=0 then Grocery_AllFoods=.;
if Grocery_FreshStore=0 then Grocery_FreshStore=.;
if grocer1=999 then grocer1=.;
if grocer2=999 then grocer2=.;

if Schools=0 then Schools=.;
if Students=0 then Students=.;
if Farmers=0 then Farmers=.;
if Community=0 then Community=.;
if ResultsRequest=0 then ResultsRequest=.;

/*Putting deliveryfreq in order*/;
/* from twice a week, once a week,twice a month, to once a month*/;
if deliveryfrequency=2 then deliveryfreq=8;
 if deliveryfrequency=1 then deliveryfreq=4;
 if deliveryfrequency=4 then deliveryfreq=2;
 if deliveryfrequency=3 then deliveryfreq=1;

/*Putting FTS participation into binary form*/;
if ((pilot=1) & (statewide=2))
or (pilot=1)or (statewide=2) then FTSpart=1;
if (noprogs=4) or ((noprogs=4) & (localfarmers=3)) or (localfarmers=3) then
FTSpart=0;

/*trying to have all distributors together for non-fresh*/;
if benekeith=1 then distributor=1;
if sysco=2 then distributor=2;
if midamerica=3 then distributor=3;
if usfoods=4 then distributor=4;
if southwestfoodservice=5 then distributor=5;
if tankersley=6 then distributor=6;
if performanceFdGroup=7 then distributor=7;
if thomasbrothersOKC=8 then distributor=8;
if ThomasBrothersTulsa=9 then distributor=9;
if buddysproduce=10 then distributor=10;
if tulsafruits=11 then distributor=11;
if Okieproduce=12 then distributor=12;
if vinyards=13 then distributor=13;
if frontierproduce=14 then distributor=14;
if TomEboggs=15 then distributor=15;
if SmallDistAll=17 then distributor=17;
if Grocery_AllFoods=18 then distributor=18;

/*for fresh alone*/;
if BenEKeith2=1 then freshdistributor=1;
if Sysco2=2 then freshdistributor=2;
if MidAmerica2=3 then freshdistributor=3;
if USFoods2=4 then freshdistributor=4;
if SouthwestFoodservice2=5 then freshdistributor=5;
if Tankersley2=6 then freshdistributor=6;
if PerformanceFdGroup2=7 then freshdistributor=7;
```

```
if ThomasBrothersOKC2=8 then freshdistributor=8;
if ThomasBrothersTulsa2=9 then freshdistributor=9;
if BuddysProduce2=10 then freshdistributor=10;
if TulsaFruits2=11 then freshdistributor=11;
if OKIEProduce2=12 then freshdistributor=12;
if Vinyards2=13 then freshdistributor=13;
if FrontierProduce2=14 then freshdistributor=14;
if TomEBoggs2=15 then freshdistributor=15;
if Small_FreshDist=17 then freshdistributor=17;
if Grocery_FreshStore=18 then freshdistributor=18;

*taking distributor and freshdist and putting into categories frequently small
dist vs big*;
if distributor=1 then commondistributor=0;
if distributor=2 then commondistributor=0;
if distributor=3 then commondistributor=0;
if distributor=4 then commondistributor=0;
if distributor=5 then commondistributor=0;
if distributor=6 then commondistributor=0;
if distributor=7 then commondistributor=0;
if distributor=8 then commondistributor=0;
if distributor=9 then commondistributor=0;
if distributor=10 then commondistributor=0;
if distributor=11 then commondistributor=0;
if distributor=12 then commondistributor=0;
if distributor=13 then commondistributor=0;
if distributor=14 then commondistributor=0;
if distributor=15 then commondistributor=0;
if distributor=17 then commondistributor=1;
if distributor=18 then commondistributor=1;

if freshdistributor=1 then commonfrdistributor=0;
if freshdistributor=2 then commonfrdistributor=0;
if freshdistributor=3 then commonfrdistributor=0;
if freshdistributor=4 then commonfrdistributor=0;
if freshdistributor=5 then commonfrdistributor=0;
if freshdistributor=6 then commonfrdistributor=0;
if freshdistributor=7 then commonfrdistributor=0;
if freshdistributor=8 then commonfrdistributor=0;
if freshdistributor=9 then commonfrdistributor=0;
if freshdistributor=10 then commonfrdistributor=0;
if freshdistributor=11 then commonfrdistributor=0;
if freshdistributor=12 then commonfrdistributor=0;
if freshdistributor=13 then commonfrdistributor=0;
if freshdistributor=14 then commonfrdistributor=0;
if freshdistributor=15 then commonfrdistributor=0;
if freshdistributor=17 then commonfrdistributor=1;
if freshdistributor=18 then commonfrdistributor=1;

*changing percentage bagged into numbers*;
if percentagebaggedcut=1 then producebaggedcut=10;
if percentagebaggedcut=2 then producebaggedcut=25;
if percentagebaggedcut=3 then producebaggedcut=50;
if percentagebaggedcut=4 then producebaggedcut=75;
if percentagebaggedcut=5 then producebaggedcut=100;
```

```
*trying to fill in blanks for cafecost by putting in averages for each size*;
**go back and find the right numbers*;
**done!*;
if ((cafecost=.) & (districtsize<500)) then cafecost=9339.29;
if ((cafecost=.) & ((districtsize>=500) &(districtsize<1000))) then
cafecost=19234.69;
if ((cafecost=.) & ((districtsize>=1000) & (districtsize<2500))) then
cafecost=31875.00;
if ((cafecost=.) & ((districtsize>=2500)& (districtsize<5000))) then
cafecost=69375.00;
if ((cafecost=.) & ((districtsize>=5000) & (districtsize<10000))) then
cafecost=63333.33;
if ((cafecost=.) & (districtsize>=10000)) then cafecost=139583.33;

if districtsize<500 then distsizegroup=1;
if ((districtsize>=500) &(districtsize<1000))then distsizegroup=2;
if ((districtsize>=1000) & (districtsize<2500))then distsizegroup=3;
if ((districtsize>=2500)& (districtsize<5000)) then distsizegroup=4;
if ((districtsize>=5000) & (districtsize<10000)) then distsizegroup=5;
if (districtsize>=10000) then distsizegroup=6;

/*Turning Breakfast into binary*/;
if breakfast <= 6 then BreakfastPart=1;
if breakfast =7 then BreakfastPart=0;

*putting breakfast into a continuous var*;
if breakfast=1 then breakfastp=250;
if breakfast=2 then breakfastp=1250;
if breakfast=3 then breakfastp=1750;
if breakfast=4 then breakfastp=3750;
if breakfast=5 then breakfastp=7500;
if breakfast=6 then breakfastp=10000;
if breakfast=7 then breakfastp=0;

if otherbene=0 then otherbene=.;

/*Making tables for syposium*/;
/* 1)BigSize v. FTSpart summerfeeding breakfastpart openclosed*/;
/* 2)BigSize V. Students served meals & breakfast daily*/;
/* 3)Bigsize V deliveryfreq*/;
/* 4)SML V delivery freq*/;
/* 5)Bigsize V Percent precut and bagged*/;
/* 6)Bigsizes v Reduced lunch (do both)*/;
/* 7)SML V Reduced*/;
/* 8)SML sizes V distributors*/;
/* 9)SML V expenses*/;

proc print data=completesurvey (obs=1);
run;
/*Getting the means for cafecosts that are missing for each size*/;
*proc freq data=completesurvey;
*tables distsizegroup*cafecost;
*run;
```

```
data Ratios; set completesurvey;
if cafecost=1 then totalcost=2500;
if cafecost=2 then totalcost=15000;
if cafecost=3 then totalcost=50000;
if cafecost=4 then totalcost=87500;
if cafecost=5 then totalcost=125000;
if cafecost=6 then totalcost=150000;

if freshexpenses2=1 then fresh=250;
if freshexpenses2=2 then fresh=1500;
if freshexpenses2=3 then fresh=3750;
if freshexpenses2=4 then fresh=6500;
if freshexpenses2=5 then fresh=9000;
if freshexpenses2=6 then fresh=10000;
if cafecost=9339.29 then totalcost=9339.29;
if cafecost=19234.69 then totalcost=19234.69;
if cafecost=31875.00 then totalcost=31875.00;
if cafecost=69375.00 then totalcost=69375.00;
if cafecost=63333.33 then totalcost=63333.33;
if cafecost=139583.33 then totalcost=139583.33;

*/delete obvious outliers/*;
if ((freshexpenses2=3) & (cafecost=1)) then delete;

percentagefresh=fresh/totalcost;
proc print data=Ratios (obs=276);
var fresh totalcost percentagefresh;
run;
************************************/*Merging data into two groups only*/;
***take all the data and have only 1 df;
data chisqtwos; set ratios;
if ((distsizegroup>0) &(distsizegroup<=3)) then districtlvl=0;
if distsizegroup>3 then districtlvl=1;
if ((breakfastp>0) &(breakfastp<=1750)) then breakfastlvl=0;
if breakfastp>1750 then breakfastlvl=1;
if ((deliveryfreq>0) & (deliveryfreq<=2)) then deliverylvl=0;
if deliveryfreq>2 then deliverylvl=1;
if ((producebaggedcut>0) &(producebaggedcut<=25)) then producebagcutlvl=0;
if producebaggedcut>25 then producebagcutlvl=1;
if ((percentagefresh>0)&(percentagefresh<=.20)) then prcntfrshlvl=0;
if percentagefresh>.20 then prcntfrshlvl=1;
if ((newpercentreduced>0)&(newpercentreduced<=2)) then newprcntreducedlvl=0;
*this is 50 percent or less;
if newpercentreduced>2 then newprcntreducedlvl=1;
run;

proc freq data=chisqtwos (obs=276);
tables FTSpart*(districtlvl breakfastlvl summerfeeding openclosed deliverylvl
producebagcutlvl newprcntreducedlvl
prcntfrshlvl commondistributor commonfrdistributor grocer1 grocer2)/chisq;run;

proc freq data=chisqtwos (obs=276);
tables FTSpart*(
newprcntreducedlvl )/chisq;run;
```

LOF Code

```
PROC IMPORT OUT= WORK.anhfinal
 DATAFILE= "F:\Anh'sStuff\4 FTS\SurveySasStuff\NewData5_22DoN
otChangedoc.xls"
 DBMS=EXCEL REPLACE;
 SHEET="Sheet1$";
 GETNAMES=YES;
 MIXED=NO;
 SCANTEXT=YES;
 USEDATE=YES;
 SCANTIME=YES;
RUN;

data CompleteSurvey; set anhfinal (drop=ID StartDate EndDate IPAddress
EmailAddressSent
FirstName LastName CustomData Name Title School Address City_Town State
District Zip_Code
EmailAddress PhoneNumber Population
 OtherProg ProductsReceived DateReceivedF_V
OtherDistributorAnyF_V OtherDist
 OtherDistributorFreshF_V2 OtherFreshDist
IfNoWhy OtherBeneficiaries OtherBarrier Comments website);

/*Trying to use reduced and free info and convert into groups*/;
**newpercentreduced=0;
/* think this is a bias so will leave it out*/;
if Percentreduced <= 25 then newpercentreduced=1;
if ((Percentreduced>25) & (Percentreduced<=50)) then newpercentreduced=2;
if ((Percentreduced>50) & (Percentreduced<=75)) then newpercentreduced=3;
if Percentreduced >75 then newpercentreduced=4;

/*Trying to get rid of zeros*/;
if Pilot= 0 then pilot= .;
if Statewide= 0 then statewide= .;
if LocalFarmers=0 then localfarmers=.;
if BenEKeith=0 then BenEKeith=.;
if Sysco=0 then Sysco=.;
if MidAmerica=0 then midamerica=.;
if USFoods=0 then USFoods=.;
if SouthwestFoodservice=0 then SouthwestFoodservice=.;
if Tankersley=0 then Tankersley=.;
if PerformanceFdGroup=0 then PerformanceFdGroup=.;
if ThomasBrothersOKC=0 then ThomasBrothersOKC=.;
if ThomasBrothersTulsa=0 then ThomasBrothersTulsa=.;
if BuddysProduce=0 then BuddysProduce=.;
if TulsaFruits=0 then TulsaFruits=.;
if OKIEProduce=0 then OKIEProduce=.;
if Vinyards=0 then Vinyards=.;
if FrontierProduce=0 then FrontierProduce=.;
if TomEBoggs=0 then TomEBoggs=.;

if BenEKeith2=0 then BenEKeith2=.;
if Sysco2=0 then Sysco2=.;
if MidAmerica2=0 then MidAmerica2=.;
if USFoods2=0 then USFoods2=.;
```

```
if SouthwestFoodservice2=0 then SouthwestFoodservice2=.;
if Tankersley2=0 then Tankersley2=.;
if PerformanceFdGroup2=0 then PerformanceFdGroup2=.;
if ThomasBrothersOKC2=0 then ThomasBrothersOKC2=.;
if ThomasBrothersTulsa2=0 then ThomasBrothersTulsa2=.;
if BuddysProduce2=0 then BuddysProduce2=.;
if TulsaFruits2=0 then TulsaFruits2=.;
if OKIEProduce2=0 then OKIEProduce2=.;
if Vinyards2=0 then Vinyards2=.;
if FrontierProduce2=0 then FrontierProduce2=.;
if TomEBoggs2=0 then TomEBoggs2=.;

if ContinuingFTS=999 then ContinuingFTS=.;

if Grocery_AllFoods=0 then Grocery_AllFoods=.;
if Grocery_FreshStore=0 then Grocery_FreshStore=.;
if grocer1=999 then grocer1=.;
if grocer2=999 then grocer2=.;

if Schools=0 then Schools=.;
if Students=0 then Students=.;
if Farmers=0 then Farmers=.;
if Community=0 then Community=.;
if ResultsRequest=0 then ResultsRequest=.;

/*Putting deliveryfreq in order*/;
/* from twice a week, once a week,twice a month, to once a month*/;
if deliveryfrequency=2 then deliveryfreq=8;
 if deliveryfrequency=1 then deliveryfreq=4;
 if deliveryfrequency=4 then deliveryfreq=2;
 if deliveryfrequency=3 then deliveryfreq=1;

 /*Putting FTS participation into binary form*/;
if ((pilot=1) & (statewide=2))
or (pilot=1)or (statewide=2) then FTSpart=1;
if (noprogs=4) or ((noprogs=4) & (localfarmers=3)) or (localfarmers=3) then
FTSpart=0;

/*trying to have all distributors together for non-fresh*/;
if benekeith=1 then distributor=1;
if sysco=2 then distributor=2;
if midamerica=3 then distributor=3;
if usfoods=4 then distributor=4;
if southwestfoodservice=5 then distributor=5;
if tankersley=6 then distributor=6;
if performanceFdGroup=7 then distributor=7;
if thomasbrothersOKC=8 then distributor=8;
if ThomasBrothersTulsa=9 then distributor=9;
if buddysproduce=10 then distributor=10;
if tulsafruits=11 then distributor=11;
if Okieproduce=12 then distributor=12;
if vinyards=13 then distributor=13;
if frontierproduce=14 then distributor=14;
if TomEboggs=15 then distributor=15;
if SmallDistAll=17 then distributor=17;
```

```
if Grocery_AllFoods=18 then distributor=18;

/*for fresh alone*/;
if BenEKeith2=1 then freshdistributor=1;
if Sysco2=2 then freshdistributor=2;
if MidAmerica2=3 then freshdistributor=3;
if USFoods2=4 then freshdistributor=4;
if SouthwestFoodservice2=5 then freshdistributor=5;
if Tankersley2=6 then freshdistributor=6;
if PerformanceFdGroup2=7 then freshdistributor=7;
if ThomasBrothersOKC2=8 then freshdistributor=8;
if ThomasBrothersTulsa2=9 then freshdistributor=9;
if BuddysProduce2=10 then freshdistributor=10;
if TulsaFruits2=11 then freshdistributor=11;
if OKIEProduce2=12 then freshdistributor=12;
if Vinyards2=13 then freshdistributor=13;
if FrontierProduce2=14 then freshdistributor=14;
if TomEBoggs2=15 then freshdistributor=15;
if Small_FreshDist=17 then freshdistributor=17;
if Grocery_FreshStore=18 then freshdistributor=18;

*taking distributor and freshdist and putting into categories frequently small
dist vs big*;
if distributor=1 then commondistributor=0;
if distributor=2 then commondistributor=0;
if distributor=3 then commondistributor=0;
if distributor=4 then commondistributor=0;
if distributor=5 then commondistributor=0;
if distributor=6 then commondistributor=0;
if distributor=7 then commondistributor=0;
if distributor=8 then commondistributor=0;
if distributor=9 then commondistributor=0;
if distributor=10 then commondistributor=0;
if distributor=11 then commondistributor=0;
if distributor=12 then commondistributor=0;
if distributor=13 then commondistributor=0;
if distributor=14 then commondistributor=0;
if distributor=15 then commondistributor=0;
if distributor=17 then commondistributor=1;
if distributor=18 then commondistributor=1;

if freshdistributor=1 then commonfrdistributor=0;
if freshdistributor=2 then commonfrdistributor=0;
if freshdistributor=3 then commonfrdistributor=0;
if freshdistributor=4 then commonfrdistributor=0;
if freshdistributor=5 then commonfrdistributor=0;
if freshdistributor=6 then commonfrdistributor=0;
if freshdistributor=7 then commonfrdistributor=0;
if freshdistributor=8 then commonfrdistributor=0;
if freshdistributor=9 then commonfrdistributor=0;
if freshdistributor=10 then commonfrdistributor=0;
if freshdistributor=11 then commonfrdistributor=0;
if freshdistributor=12 then commonfrdistributor=0;
if freshdistributor=13 then commonfrdistributor=0;
if freshdistributor=14 then commonfrdistributor=0;
```

```
if freshdistributor=15 then commonfrdistributor=0;
if freshdistributor=17 then commonfrdistributor=1;
if freshdistributor=18 then commonfrdistributor=1;

*changing percentage bagged into numbers*;
if percentagebaggedcut=1 then producebaggedcut=10;
if percentagebaggedcut=2 then producebaggedcut=25;
if percentagebaggedcut=3 then producebaggedcut=50;
if percentagebaggedcut=4 then producebaggedcut=75;
if percentagebaggedcut=5 then producebaggedcut=100;

*trying to fill in blanks for cafecost by putting in averages for each size*;
**go back and find the right numbers*;
**done!*;
if ((cafecost=.) & (districtsize<500)) then cafecost=9339.29;
if ((cafecost=.) & ((districtsize>=500) &(districtsize<1000))) then
cafecost=19234.69;
if ((cafecost=.) & ((districtsize>=1000) & (districtsize<2500))) then
cafecost=31875.00;
if ((cafecost=.) & ((districtsize>=2500)& (districtsize<5000))) then
cafecost=69375.00;
if ((cafecost=.) & ((districtsize>=5000) & (districtsize<10000))) then
cafecost=63333.33;
if ((cafecost=.) & (districtsize>=10000)) then cafecost=139583.33;

if districtsize<500 then distsizegroup=1;
if ((districtsize>=500) &(districtsize<1000))then distsizegroup=2;
if ((districtsize>=1000) & (districtsize<2500))then distsizegroup=3;
if ((districtsize>=2500)& (districtsize<5000)) then distsizegroup=4;
if ((districtsize>=5000) & (districtsize<10000)) then distsizegroup=5;
if (districtsize>=10000) then distsizegroup=6;

/*Turning Breakfast into binary*/;
if breakfast <= 6 then BreakfastPart=1;
if breakfast =7 then BreakfastPart=0;

*putting breakfast into a continuous var*;
if breakfast=1 then breakfastp=250;
if breakfast=2 then breakfastp=1250;
if breakfast=3 then breakfastp=1750;
if breakfast=4 then breakfastp=3750;
if breakfast=5 then breakfastp=7500;
if breakfast=6 then breakfastp=10000;
if breakfast=7 then breakfastp=0;

if otherbene=0 then otherbene=.;

/*Making tables for syposium*/;
/* 1)BigSize v. FTSpart summerfeeding breakfastpart openclosed*/;
/* 2)BigSize V. Students served meals & breakfast daily*/;
/* 3)Bigsize V deliveryfreq*/;
/* 4)SML V delivery freq*/;
/* 5)Bigsize V Percent precut and bagged*/;
/* 6)Bigsizes v Reduced lunch (do both)*/;
/* 7)SML V Reduced*/;
```

```
/* 8)SML sizes V distributors*/;
/* 9)SML V expenses*/;

proc print data=completesurvey (obs=1);
run;
/*Getting the means for cafecosts that are missing for each size*/;
*proc freq data=completesurvey;
*tables distsizegroup*cafecost;
*run;

data Ratios; set completesurvey;
if cafecost=1 then totalcost=2500;
if cafecost=2 then totalcost=15000;
if cafecost=3 then totalcost=50000;
if cafecost=4 then totalcost=87500;
if cafecost=5 then totalcost=125000;
if cafecost=6 then totalcost=150000;

if freshexpenses2=1 then fresh=250;
if freshexpenses2=2 then fresh=1500;
if freshexpenses2=3 then fresh=3750;
if freshexpenses2=4 then fresh=6500;
if freshexpenses2=5 then fresh=9000;
if freshexpenses2=6 then fresh=10000;

if cafecost=9339.29 then totalcost=9339.29;
if cafecost=19234.69 then totalcost=19234.69;
if cafecost=31875.00 then totalcost=31875.00;
if cafecost=69375.00 then totalcost=69375.00;
if cafecost=63333.33 then totalcost=63333.33;
if cafecost=139583.33 then totalcost=139583.33;

*/delete obvious outliers/*;
if ((freshexpenses2=3) & (cafecost=1)) then delete;
percentagefresh=fresh/totalcost;
proc print data=Ratios;
var fresh totalcost percentagefresh;
run;
proc means data=ratios;
var percentagefresh districtsize;
run;

*with lackfit;
proc logistic des data=ratios (obs=276) ;
model FTSpart=districtsize percentreduced summerfeeding Openclosed
commonfrdistributor percentagefresh/lackfit;
run;

proc logistic des data=ratios(obs=276);
model FTSpart=districtsize percentreduced
commonfrdistributor percentagefresh/lackfit;
run;

proc logistic des data=ratios(obs=276);
model FTSpart=districtsize
```

```
commonfrdistributor percentagefresh/lackfit;
run;

*with rsq;
proc logistic des data=ratios(obs=276);
model FTSpart=districtsize percentreduced summerfeeding Openclosed
commonfrdistributor percentagefresh/rsq;
run;

proc logistic des data=ratios(obs=276);
model FTSpart=districtsize percentreduced
commonfrdistributor percentagefresh/rsq;
run;

proc logistic des data=ratios(obs=276);
model FTSpart=districtsize
commonfrdistributor percentagefresh/rsq;
run;
```

VITA

Anh Vo

Candidate for the Degree of

Master of Science

Thesis: OKLAHOMA FARM-TO-SCHOOL ECONOMIC VIABILITY AND EFFICIENCY

Major Field: Agricultural Economics

Biographical:

Personal Data: Born in Tulsa, Oklahoma on September 28, 1980, daughter of Vien and Diep Vo, and sister of Quoc and Andy.

Education: Graduated for Booker T. Washington High School, Tulsa, Oklahoma in May 1999; received a Bachelor of Arts degree in political science and French in May 2003; and completed the requirements for the Master of Science in agricultural economics at Oklahoma State University, Stillwater, Oklahoma in December, 2009.

Experience: Agricultural Extension Peace Corps volunteer in Senegal, West Africa, 2003-2005; Graduate Research assistant, Department of Agricultural Economics, Oklahoma State University, August 2007 to August 2009.

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Name: Anh Ngoc Vo Date of Degree: December, 2009

Institution: Oklahoma State University Location: OKC or Stillwater, Oklahoma

Title of Study: OKLAHOMA FARM-TO-SCHOOL ECONOMIC VIABILITY AND EFFICIENCY

Pages in Study: 97 Candidate for the Degree of Master of Science

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Scope and Method of Study: This study analyzes characteristics of school districts associated with Farm-to-school participation (FTS) by using logit models. In addition, a transportation cost template was created to determine a least cost method to distribute FTS commodities.

Findings and Conclusions: Among the variables used in the logit model, three are statistically significant. District size and the budget for produce are positively related to FTS participation; whereas, food distributor type is negatively related to FTS participation. The information and tools provided in this study will be useful to farmers, school food personnel, and policy makers when making decisions to implement FTS programs.

ADVISER'S APPROVAL: Rodney Holcomb